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Conservation, Livelihood and Democracy: Social Dynamics of Environmental Changes in Africa

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Preface

There has been a tendency in Africa, as elsewhere, to view the environmental problem in ecological, physical and technical terms. The social aspects of environment have been largely neglected both in analysis and policies. This has contributed to the high failure rate of official conservation programmes and policies in most African countries both in the colonial and the post-independence period. The purpose of this paper is to provide a social perspective on the extent, emergence and amelioration of the environmental crisis in sub-Saharan Africa.

The available indices point to a grim picture of environmental degradation in Africa as expressed in soil erosion, deforestation, desertification and sedimentation and pollution of waterways. Although there are serious doubts about the reliability of these data, circumstantial evidence and in-depth micro studies corroborate this picture. There is even greater paucity of information on the social manifestations of the environmental crisis. The problem is further compounded by the difficulty of isolating the impact of environmental factors from the many variables which impact on social conditions.

Natural disasters provide the most dramatic illustration of the social impact of changes in environment. The great droughts of the early 1970s and the 1980s resulted in the deaths of hundreds of thousands from starvation and malnutrition. Tens of millions were forced to abandon their homes in search of food. There was large-scale decimation of livestock that contributed further to the impoverishment of the rural people. The cumulative degradation of natural resources has jeopardized the livelihood sources for scores of millions of farmers, herders and forest dwellers. The effects have been felt through declines in yields and food production, dwindling access to forest produce and game, declining productivity of grazing land and increasing scarcity and cost of wood fuel. The environmental crisis has reinforced urban migration, disrupted community life and provoked local, national and regional conflicts. Women and girls have been especially adversely affected because of their role in food production, family upkeep and fetching of water and wood fuel.

In the pre-colonial period, the local communities had by and large succeeded in evolving systems of resource use and management which combined livelihood security with resource conservation. These systems were disrupted during the colonial period by the expropriation of land for white settlers and for plantations, commercialization of agriculture, inappropriate macro economic policies and ill-conceived infrastructural projects. Many of these policies were continued in the post-independence period. Rapid and accelerating population expansion in recent decades has greatly increased the pressure on resources.

The past patterns of economic development are socially and ecologically unsustainable. There is urgent need for new approaches designed to integrate resource conservation with livelihood improvement. A key element of this approach is the progressive transfer of responsibility to local communities and organizations for the management of natural resources. There is impressive historical evidence of the ability of pre-colonial societies in Africa to adapt production systems and livelihood strategies to local ecological conditions with environmental sustainability. There are also numerous contemporary experiences from different ecological zones of the ability of local communities to restore and improve degraded resources through technical innovations, social mobilization and institutional and organizational improvements.

For a locally based resource conservation strategy to work, it will be necessary to transfer responsibility and resources to local communities, initiate property reforms relating to ownership, use and access to resources, and strengthen the technical and managerial capabilities of organizations of rural producers. Because of the enormity of the challenge, these efforts can only succeed if they are supported by sympathetic individuals,

organizations, national authorities and the international community. External assistance will be required to solve technical problems, elaborate programmes for raising labour and resource productivity, conduct field research and furnish food, materials and cash. But it is important that such assistance should reinforce local efforts, enhance local capabilities, build upon indigenous knowledge and skills and respect community priorities.

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Introduction

Concern with environment is not a recent phenomenon in Africa. Already at the turn of the century there were serious debates and learned discussions about the deteriorating soil conditions and excessive deforestation in the Cape Colony in South Africa (Grove, 1987). Likewise the British, German and French colonial authorities were preoccupied with this problem in the 1920s and 1930s and took a variety of preventive measures (Darkoh, 1987; Korir-Koch, 1991). Many of these measures were of a coercive nature often relying on forced labour for construction of structures for soil conservation and compulsory destocking to ease the pressure on rangelands. They were deeply resented by farmers, pastoralists and forest dwellers. It was therefore not surprising that governments which came to power after independence decided to abandon them. However, after a period of benign neglect in the early years of independence, African governments have become increasingly alarmed by the state of the environment and are now setting in motion wide-ranging measures to arrest and reverse its degradation.

Throughout much of this period, there has been a tendency to view the environmental problem in physical, ecological and technical terms. The problem is defined as loss of soil, disappearance of forests, extinction of wildlife and plant species, spread of deserts, pollution of waterways and sedimentation of dams and irrigation facilities. The villain of the piece is the nomadic herder, the subsistence farmer and the forest dweller whose galloping numbers and primitive methods of earning a livelihood are portrayed as putting intolerable pressure on limited and fragile resources. The measures devised to cope with the problem have focused on technical solutions involving land use and alleviation of human and animal pressure on resources. Conceived by government officials and international experts, they have been imposed upon a largely passive if not an outright hostile populace. It is not surprising that most of these measures have failed to achieve their objectives.

In recent years, some attempts have been made to view the environmental problem in a holistic framework integrating physical and ecological with social and political processes. This is an important advance but the full implications of this approach continue to be largely neglected or insufficiently reflected in the design and implementation of measures for environmental rehabilitation and conservation. The purpose of this paper is to present a social perspective on the environment problem and to outline an approach to resource conservation informed by this perspective.

A social approach to environment focuses on issues of ownership, control and management of natural resources. It addresses questions of power and conflicts of interest (Redclift, 1987, 1992; Vivian, 1992). It brings out the complex and multiple interactions between social and natural systems. It pays attention to institutions, motivation and incentives. And it stresses the vital links between resource conservation and human needs. Thus a strategy for environmental improvement is unlikely to succeed if it neglects the social dimension. Reliance upon purely ecological, technical or economic approaches is undoubtedly one of the reasons for the failure of many conservation programmes and policies.

The next section looks at some indices of environmental stress. Starting with the conventional physical measures, the paper discusses the principal social consequences of environmental degradation. Section 2 contains an analysis of the dynamics of environmental deterioration. Special attention is paid to the traditional systems of resource management and their breakdown under colonial rule, the processes of modernization and population expansion. Section 3 outlines an approach to conservation based on livelihood security and community empowerment. This approach is built around a strategy promoting a progressive

restoration of sovereignty over natural resources to local communities and a strengthening of their capabilities in partnership with the state and the international community.

Given the vast scope of the paper in terms of both the region and the issues covered, it has not been possible to provide detailed empirical and analytical justification of the propositions advanced. The sources cited furnish further support to the points made here. This paper should rather be seen as providing a broadbrush social perspective on the extent, emergence and amelioration of the environmental crisis in sub-Saharan Africa. The focus is on natural resources and the rural sector. No attempt has been made to discuss industrial and water pollution or urban environmental problems.

1. Environmental Degradation from a Social Perspective

There is a close relationship between indices of environmental stress and the extent of social hardship and suffering. The data on such physical and social indicators are often incomplete or unreliable but in conjunction with other evidence they point to a dramatic picture of environmental damage in the continent.

1.1 Some Physical Indices of Environmental Deterioration

From all accounts the environmental crisis in Africa is serious and getting worse. The available indicators point to an alarming deterioration in the quality and quantity of natural resources. Just to mention a few commonly cited figures, Africa's 703 million hectares of forests are being cleared at the rate of 3.7 million hectares (or 0.6 per cent) each year; deforestation outstripped the rate of new tree planting by 29 to 1 (World Bank, 1989); more than 63 per cent of the original wildlife habitat has been lost (McNamara, 1990).

Soil erosion has assumed serious dimensions. The affected areas are experiencing soil loss at the rate of 10 to 200 tons per hectare. More than 35 per cent of the land north of the Equator is affected by either erosion or salinity (FAO, undated). It is reported that 80 to 90 per cent of Africa's rangelands and 80 per cent of cropped land in the dryland areas may be affected by soil degradation (World Bank, 1989). Nearly 34 per cent of African land is under threat of desertification (FAO, undated). There is growing pollution of waterways and sediment levels in rivers have been increasing at 5 per cent per annum in countries like Nigeria, Tanzania and Zimbabwe.

Most of the above figures are averages for the continent as a whole or for sub-Saharan Africa. For certain countries the situation is much worse. The Sahelian countries are suffering more acutely from the encroaching desert. In Ethiopia, annual loss of topsoil has been estimated at a staggering figure of 3.5 billion tons (Harrison, 1987). Nearly 50 per cent of the land area in Tanzania is subject to soil erosion and requires remedial action (Blackwell et al, 1991). The following countries have lost more than 80 per cent of their original moist forests: Angola, Burundi, Côte d'Ivoire, Ghana, Guinea-Bissau, Kenya, Liberia, Madagascar, Nigeria, Senegal, Sierra Leone, Sudan, Tanzania, Togo and Uganda. The area under wetlands and marsh has declined by more than 60 per cent in Cameroon, Chad, Malawi, Niger and Nigeria. Mangroves have declined by 60 per cent or more from their original levels in Côte d'Ivoire, Djibouti, the Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Mozambique, Somalia and Tanzania (World Resources Institute, 1990).

The data cited above are admittedly rough estimates of the magnitude of the problem. The terms such as deforestation, soil degradation and desertification raise conceptual problems (Barraclough and Ghimire, 1990; Blaikie and Brookfield, 1987). The actual measurement of these phenomena in African countries is fraught with all kinds of difficulties. There are few countries which can boast of accurate statistics on most dimensions of the state of

environment. After looking at the literature on land degradation, one commentator came to the conclusion:

“Any honest reviewer of the current situation would have to come to the same conclusion as a 1986 IFAD review which stated bluntly that the ‘extent of erosion in Africa south of the Sahara cannot yet be quantified’” (Fones-Sundell, 1989).

While it is not possible at this stage to make an accurate quantitative estimate of the dimensions of the environmental crisis in Africa, there is considerable circumstantial evidence from various micro studies and from indicators such as declining soil fertility and growing scarcity of fuelwood which points to both the seriousness of the situation and worsening trends over the past few decades. Nevertheless, for more effective planning and monitoring, there is an urgent need for an evaluation of the reliability of the currently available data and for gathering priority information on environmental indicators through low-cost methods including local, field level surveys and inquiries.

1.2 Social Impact of Environmental Crisis

Imperfect as the data on the physical indicators of environmental degradation are, there is even greater paucity of information on its social impact. Part of the problem arises from the difficulty of separating the impact of environmental changes from those of other events and policies. For instance, it is tempting but hardly justified by the present state of knowledge to attribute the catastrophic economic performance of sub-Saharan Africa over the last 10 to 15 years to accelerating degradation in environment. There is little doubt that environment in all its facets has played some part in the prolonged economic crisis of the 1980s, but it would be foolhardy to attribute a quantitative dimension to this role. A more accurate idea of the nature and extent of the human impact of environmental deterioration is provided by in-depth local studies in African countries.

The social consequences of environmental degradation are pervasive and wide-ranging extending from death to pauperization, from hunger to ill-health, from community disruption to family break-ups, from massive migration to inhuman work load for women and from local conflicts to national and regional wars. This section looks first at the social effects of natural disasters before turning to a consideration of the impact of environmental stress on production, incomes and consumption, health, migration and work patterns. It concludes with a brief discussion of the political and armed conflicts provoked by resource degradation and scarcity.

Natural disasters provide the most dramatic illustration of the social impact of changes in environment. Earthquakes, floods and droughts occur periodically in different regions of the world and take their toll in human lives, destruction of property, loss of livelihood, impoverishment, physical disabilities and disruption of communities. Africa has been ravaged more by droughts than other forms of natural disasters. They have occurred periodically and affected large parts of the region. The last two decades have been especially deadly.

The great drought of the early 1970s struck the Sahelian and the Sudano-Ethiopian regions. Between 100,000 and 250,000 people died in the Sahel according to a report prepared for the United Nations Conference on Desertification. Millions were reduced to destitution provoking mass migration to urban areas in search of work and relief. According to FAO, an estimated 3.5 million head of cattle, 25 per cent of the total, died in the Sahel in 1972-1973 alone (Grainger, 1990). The social tragedy was enacted on an even grander scale in the Sudano-Ethiopian region with much bigger numbers of human deaths and decimation of livestock.

The 1983-85 drought hit 30 countries in western, eastern and southern Africa. In March 1985, the peak of the crisis, it was estimated that 30 million were affected by the drought. Ten million of them were forced to abandon their homes in search of food. In Niger, half the population suffered from the effects of drought. In Ethiopia and Sudan, eight and ten million people respectively were affected. In Botswana, over half the population was dependent on food aid (Harrison, 1987). Millions in other countries, especially Angola and Mozambique, survived through food aid.

This is not the place to discuss the important question of the extent to which environmental disasters such as the drought are a purely “natural” phenomena and the extent to which they are “man-made”. There is a growing technical literature and a considerable amount of controversy on the subject. Less contested are the pattern of and responsibility for the social consequences. It is the poorest farmers and herders and the assetless poor, in other words those with the least or most vulnerable entitlements, who are the most exposed to hunger, famine and starvation. Likewise, the experiences in Africa and elsewhere show that there is no inherent link between drought and famine. The ultimate responsibility for famine and starvation must rest on social and economic structures, tragic errors of policy and criminal negligence by national and international authorities (Franke and Chasin, 1980; Glantz, 1987; Mortimore, 1985; Sen, 1980; Watts, 1983).

While natural disasters bring out in a spectacular manner the link between environment and human welfare, it is the social impact of gradual cumulative changes in environment which has dominated policy discussions. These changes affect the quality and quantity of resources available to individuals, families and communities. Since natural resources directly or indirectly form the basis of livelihood for a great majority of the population in most African countries, their characteristics and distribution affect human welfare and social relations. Environmental degradation affects incomes and consumption through its impact on agricultural and livestock production and availability of forest produce and wildlife.

It is widely believed that environmental degradation has contributed to the poor agricultural performance of African countries over the past decade and a half though it is impossible to quantify its impact. The principal mechanisms are stated to be decline in land fertility through soil erosion and monocropping, loss of cultivable land through desertification, reduction in the quality of pasture lands through over-grazing, cultivation of low potential, semi-arid lands and disappearance of forests.

One measure of the impact of land degradation is the effect on yields of food crops. According to the data put together by FAO and ECA, 14 African countries experienced declining yields of maize, 12 of millet and sorghum and 15 of rice over the period 1971-80 or 1983 (ECA-FAO, 1992). While suggestive, such aggregate figures cannot accurately reflect the impact of land degradation. Not only do they combine production data from many countries with differing performance but they are also influenced by factors such as weather and national and international policies bearing on agriculture and food. It is therefore necessary to have recourse to national and micro studies to obtain more precise estimates of the effect of land degradation on yields and production.

There are few studies which attempt to quantify the economic costs of soil erosion and land degradation either at the level of individual farmer or the society as a whole (Fones-Sundell, 1989). But some partial estimates have been made. In Ethiopia, soil erosion is estimated to result in an annual loss to grain production of 1 million tons (Blackwell et al., 1991). In Zimbabwe, the nutrient loss through soil erosion was valued at US \$ 1,500 million in fertilizer equivalent in 1985 (FAO, undated).

Through its impact on fertility, soil erosion has reduced yields of foodcrops. In the tropics as a whole, erosion on shallow or impoverished soils reduces maize yields by 30 to 70 per cent (Blackwell et al., 1991). Sometimes farmers have had to substitute less nutritious crops, such as cassava for millet in Zambia. Likewise, the move to marginal areas has resulted in lower yields. The effect has been a declining or stagnant production of food and cash crops for millions of small farmers throughout the continent. The consequent inadequacy of food and cash has led to a search for supplementary income-earning opportunities through casual, part-time jobs and migration to urban areas.

The crisis has been more severe for the 15 to 25 million nomadic herders who have been hit by a series of disasters - armed conflicts, prolonged droughts, encroaching desert, settlement schemes that squeeze on pasture lands, creation of protected areas, expansion of cultivated area and degradation in the quality of the land available for grazing. Some nomads have been forced to abandon their traditional way of life to seek livelihood as subsistence farmers, wage workers or recipients of relief aid. For the rest, environmental degradation has reduced animal productivity and increased food insecurity.

Millions of people in Africa derive all or part of their subsistence requirements and cash income from the forests. The forests furnish them with food, medicines, building materials and household equipment, raw materials for agricultural processing and fuelwood. In west Africa, bushmeat, palm products such as oil and wine, medicines, fuelwood and building materials are the most highly utilized forest products (FAO, 1990). Bushmeat, fruits, nuts, vegetables, palm wine, medicines and fuelwood are also an important source of cash income. Poor households and women are especially dependent upon the forests for their subsistence and cash needs (FAO, 1990). Forest products are an important source of nutrition providing protein, energy, fibre, vitamins and essential minerals (FAO, 1989). The accelerating deforestation, demarcation of areas for national parks and protected forests and other measures of exclusion have deprived large numbers of people of their traditional access to forest products thus threatening their sources of livelihood (Ghimire, 1991, Koch et al., 1990).

In many ways women in the rural areas have been the most affected by the environmental crisis. Nearly 80 per cent of the economically active women in sub-Saharan Africa are in agriculture and are responsible for 70 per cent of food production in Africa. In their capacity as food producers, they have seen the returns to their labour reduced by declining soil fertility and cultivation in marginal areas. The migration of male members of the household induced by scarce or degraded resources has further contributed to their responsibilities and work load. An indication of the scale of the problem is given by the growing numbers of female-headed households, which now amount to 20 per cent in Africa with an even higher proportion in rural areas. In Botswana female-headed households are estimated at 45 per cent, in Malawi at 29, Zambia at 28 and Ghana at 27 (United Nations, 1991).

Labour force surveys estimate the total working time for women in Africa at 67 hours per week. Small-scale studies suggest that women and girls spend on average 5 to 17 hours per week collecting and carrying water (United Nations, 1991). The growing scarcity and escalating price of fuelwood has further increased their work load. Women and girls spend long hours in collecting fuelwood with adverse effect on family nutrition and health (Cecelski, 1987). Women in the Transkei in South Africa cover 6 to 9 kilometres each day, scouring the bush for firewood and collecting loads of about 30 kilograms (Koch et al., 1990). The additional work burden carried by women and increasing scarcity and cost of fuelwood have negative effects on family welfare and health, especially of children. Less nutritious food may be chosen; it may not be cooked properly. The water may not be boiled.

The discussion so far has been concerned with the impact of resource degradation on individual and family welfare. Environmental crisis has also provoked social unrest and conflict. Several governments, most notably the Haile Selassie régime, have been swept from power by the suffering and unrest associated with drought and famine. With continuing degradation and increasing scarcity of natural resources, the struggle and competition for them are likely to become a potent source of conflicts among communities and countries. The movements of farmers, herders, forest dwellers and the landless away from dwindling resources toward areas less subject to environmental stress has intensified conflicts in several countries and can be expected to further exacerbate ethnic and national tensions and animosities (Hjorst af Ornäs and Mohamed Salih, 1989).

2. Dynamics of Environmental Degradation

Environmental change is a complex phenomenon. It is the result of intricate interactions among social, ecological and physical systems. This section focuses on the impact of policies, institutions and human activities on the state of environment. Environment in Africa, perhaps even more than in other regions, is highly varied with infinite local specificities. The account given here is necessarily selective in highlighting critical mechanisms and important tendencies. It begins with an analysis of the traditional systems of resource management that reflect centuries of adaptation in the search for secure livelihood. It then examines the environmental impact of the establishment of colonialism and European settlement. This leads to a discussion of the role of modernization and state policies in resource degradation. The section then considers the impact of population expansion concluding with some observations on the sustainability of the current patterns of development and resource use and management.

2.1 Environment and Livelihood under Traditional Systems

Environmental stress is a relatively new phenomenon in Africa's long history. It is true that African soils are more fragile, the timing and quantity of rainfall more variable and that there is greater predominance of arid and semi-arid areas than in other regions of the world. It is also true that African communities have from time immemorial been periodically ravaged by droughts, floods and diseases. But it is a measure of their tremendous social achievement that pre-colonial African societies had evolved systems of the use and management of natural resources that by and large ensured both environmental integrity and secure livelihood. Evidence from different parts of the continent bears testimony to ingenious and sophisticated adaptation of the production systems to the unique characteristics of the African environment (Watts, 1983; Kjekshus, 1977; Franke and Chasin, 1980; Molutsi, 1988; Wamalwa, 1991).

The continent possesses an extremely varied topography comprising most major ecological systems. These include tropical forests, cool highlands, humid coastal areas, riverine and marshy zones, extensive savannahs, semi-arid regions and vast stretches of desert. The soils and rainfall are also highly variable. The principal activities comprised cultivation, herding, hunting and gathering. The land tenures showed a great deal of variation generally combining communal ownership with private use. Some resources were allocated for the use of families while others were reserved as common property.

This ecological diversity gave rise over time to an extraordinary variety of production systems which sought to exploit the local and regional specificities to assure secure livelihoods. Thus as illustrated below, intensive cultivation, shifting agriculture, organic fertilizers, intercropping, mixed farming, hillside, wetlands and dry plains cultivation, water harvesting and irrigation, soil and forest conservation, nomadic and transhumance pastoralism, all have formed part of the traditional production systems of different African communities.

Running through the diversity of ecological and production systems were some common characteristics of resource use and management. Nature in all its manifestations constituted an organic part of the world view of most communities. It was treated with reverence and respect. This attitude has been described as “living in nature” (Wamalwa, 1991; Turton, 1989). It is manifested in the designation of certain rivers, hills, mountains, forests, groves and trees as sacred places for worship and burial. Perhaps one of the most beautiful examples of the reverence for nature is provided by the custom of the Tembe-Thonga people of Kosi Bay in South Africa of showing new-born babies to the moon and taking them down to the beach and allowing a wave to wash over them (Koch et al., 1990).

Secondly the customary systems were based on an extensive use of resources. This was necessitated by technology and made feasible by abundance of resources in relation to population. Even in areas of dense population there were adequate resources to sustain a system of extensive exploitation of resources. The population was held in balance by a régime of high fertility and high mortality. This characteristic of the African system of resource use was illustrated by the widespread practice of shifting agriculture under which land was cleared and cultivated for a certain period before being abandoned for regeneration through natural processes. The same principle was evident in the practice by nomadic people of constantly moving their herds to take advantage of water and grass for their livestock. Seasonal mobility across ecological regions was a central feature of herding communities in most regions of the continent. It served both to conserve resources and provide insurance against loss of livestock through disease, raid or lack of nourishment.

The third common characteristic of the African systems was a set of institutions and rules which governed the use and management of natural resources. It is too often assumed that the traditional systems were characterized by a free-for-all anarchic exploitation of resources. While it is possible that in some exceptionally richly endowed regions with very sparse populations, the regulatory mechanisms may have been minimal or even non-existent, most communities had evolved systems which in varying degrees conserved resources and ensured their equitable distribution among households.

The fourth widespread feature of the system was highly localized adaptation of agricultural, herding, fishing and gathering practices to fully exploit the extraordinary ecological diversity characteristic of many regions in Africa. Its corollary is very considerable experimentation and innovation undertaken by peasant farmers with inputs and methods of production (Richards, 1985) This finding, supported by a growing body of evidence, contrasts with the widely held view of static and uniform techniques of production handed down through the generations.

The general points made above may be selectively illustrated with examples of customary systems of resource management chosen from different regions and ecological zones. The Tembe-Thonga people of Kosi Bay coast and the neighboring-area in South Africa live in an ecological paradise and derive their livelihood from fishing and forest produce. Their holistic approach to resource conservation includes aspects of land tenure, taboos, myths, gender roles and harvesting techniques. Some species of indigenous fruit trees are preserved through privatization by allocating them to individuals in the community. Sites where palms are tapped for the juices used in palm wine, as well as fish trapping locations, are granted to individuals for supervision and protection against over-exploitation. When fresh water stocks are low, the more efficient methods of fishing are banned by the local headman or even by the fishermen themselves. Likewise seasonal restrictions are placed on gathering and hunting (Koch et al., 1990).

Examples of the development of intensive and environmentally sound methods of cultivation come from several parts of Africa. The Konso of south-west Ethiopia have developed a complex and sophisticated form of agriculture that has allowed them to subsist in a mountainous area with fragile soils and an irregular rainfall. Their farming is based on an elaborate system of terracing, a variety of soil and water management practices, the integration of livestock and forestry with the rest of their agriculture, and the use of manure and compost to maintain soil fertility (FAO, undated). The Kikuyu in Kenya also relied on a mixed farming system combining animal husbandry with multiple cropping in a careful spatial pattern to conserve water and reduce soil erosion (Korir-Koch, 1991).

In south-eastern Nigeria, forest farmers have developed sophisticated systems of tree and crop farming that mimic the multi-storeyed vegetation of the rainforest that surrounds them. The Chagga who farm the southern slopes of Mount Kilimanjaro have for more than a century made careful use of melting snows, tapping the water of high mountain streams into networks of skilfully aligned irrigation channels. Apart from practising stall feeding and using organic material to improve soil fertility, they also developed their own system of multi-layer farming, growing intercropped yams, sweet potatoes, maize, beans and peas among coffee bushes, with banana palms providing shade (Harrison, 1987). A similar system was developed in the western Usumbaras in Tanzania with a multi-storeyed agricultural system and integration of agroforestry with crop cultivation (Mascarenhas and Maganga, 1991).

Numerous examples of agricultural innovation and experimentation have been documented in west Africa (Richards, 1985). Intercropping occurs in 80 per cent of all farms in west Africa. It results in better and more reliable yields, a smoother labour input profile and better control of pests, weeds and diseases. Wetlands agriculture is another area where west African smallholders have been especially inventive with rice cultivation in flood plains and swamps and utilizing a variety of small-scale irrigation schemes. After considerable experimentation, the Itake farmers in western Nigeria moved to a gradual substitution of cassava for yams in response to changed ecological conditions, labour supply constraints and new market conditions. In the Mogwamama area alone in Sierra Leone, 78 farm households planted a total of 59 distinct rice varieties!

The herding communities had also developed intricate and efficient systems for exploiting rangelands while conserving the environment. In the Ferlo region in northern Senegal, the Peul tribe practised a well-organized system of cultivation and grazing based on transhumance (Toure, 1988). The cattle were moved to take advantage of the rainy season and after the harvests left to graze on the fields supplying manure to the soil. The symbiotic relationship between the herding and farming communities was mutually beneficial and quite widespread in the Sudano-Sahel region. Ecological imperatives as well as husbandry and commercial considerations imposed perpetual motion on cattle and their herders. The system required strict administration of access rights to water and grazing land. Customary law guaranteed free access to the bush zones but imposed strict management rules for agro-pastoral areas.

Similar systems were developed by the herding communities in east Africa. The Barabaig of the Hanang plains in Tanzania have devised a seasonal grazing rotation that exploits the forage régimes at different times of the year (Lane, 1992). Open rangeland is regarded as the property of the whole community. The Barabaig used a variety of arrangements to protect land. Some groups are assigned the duty to protect their land against intruders. Within the commons, rights to property range from communal access to exclusive private possession. The Barabaig regulate rights of use and access to land through a tripartite jural structure, each with its own sphere of interest and authority: the community, the clan and individual

households. Likewise the Maasai of the Kajiado district in Kenya had evolved an elaborate system of range management involving reserved and sequenced grazing, neighborhood based controls on grazing, collective action against invaders and punishment and fines for infringement of customary rules (Brokenshaw and Little, 1987).

2.2 Colonial Roots of Environmental Degradation

The establishment of colonial rule in the nineteenth and early twentieth centuries in most parts of Africa set in motion a series of developments with profound implications for the environmental balance. The principal mechanisms disturbing the equilibrium were expropriation of land for settlement and plantations, assumption of state sovereignty over natural resources, commercialization of agriculture, development projects and policies and population growth.

Large tracts of grazing and crop lands were expropriated either for European settlement as in many eastern and southern African countries or for plantations as in several central and west African countries. This was accompanied by the demarcation of land as colonial territories of different European powers. These developments not only disrupted the long established systems of shifting cultivation and nomadic pastoralism but also confined indigenous populations to restricted areas often of low agricultural potential. A number of methods using varying degrees of coercion were employed to secure labour for European farms, plantations and mines (Brett, 1973; Palmer and Pearson, 1977). This established the migratory system which resulted in prolonged periods of absence of male members and consequent neglect of their role in sound resource management practices, apart from greatly adding to women's work load. The overcrowding of croplands, the closing off of seasonal pastures and the absence of males effectively undermined the traditional systems of resource management in many areas thus laying the foundations of environmental degradation.

The adverse effect on effective resource management was reinforced by the assumption of sovereignty by the colonial states over forests, mountains and hills, lakes and rivers and grazing and crop lands. The situation varied by regions and colonial authorities but the general trend was toward increasing central control and growing disenfranchisement of local communities. For instance, in 1930 the French colonial authorities expropriated all common lands and established a forestry code which extended state rights to all forest areas (Lawry, 1989). The process was continued after independence from colonial rule. In the Sudan, the state took control of range regulations from local authorities in the 1960s, while in Botswana local grazing and water management systems have been supplanted by District Land Boards (Brokenshaw and Little, 1987). In Ghana rights in the forest lands invested in the traditional groups and governed by customary rules were transferred to the central government in the early 1970s (Repetto and Gillis, 1988).

While the state took over formal responsibility for the management of commons and other resources previously governed by customary rules, it was rarely able to exercise effective control. This created the worst possible situation from the point of view of resource conservation: the traditional system of resource management was effectively undermined but nothing was put in its place. The result was uncontrolled and short-sighted exploitation of common property resources that further accelerated environmental degradation.

The commercialization of agriculture whether through the establishment of large farms and plantations or the cultivation of cash crops by peasant farmers was an additional source of environmental stress. The search for profits brought an ever increasing area of land under cultivation. Some of the earlier practices of crop rotation, intercropping, mixed farming and shifting cultivation were either abandoned or restricted. While tree crops such as cocoa, coffee and tea have beneficial effects on soil conservation, the growth of export commodities

such as cotton and groundnuts reduced soil fertility and increased its vulnerability to erosion. This was especially the case with continuous monocropping. The deleterious effects on soil fertility have also been observed with continuous monocropping of food crops such as maize even when fertilizers are used. In Zambia, for instance, maize yields have been declining in some areas by 20 per cent per annum even with fertilizer use (Blackwell et al., 1991).

2.3 Development Projects and Policies

There are many other elements of official policies both in the colonial and in the post-independence period which have contributed to environmental deterioration. The agricultural sector has been heavily taxed directly or indirectly, especially since the Second World War (World Bank, 1981). The farmers have thus been deprived of means which might have contributed to beneficial investment in resource conservation and improvement. Some other aspects of macro policies such as commodity and natural resource pricing, subsidies to inappropriate technology, harmful pesticides and large-scale commercial ventures have had detrimental effects on the environment (Repetto and Gillis, 1988; Lane, 1992).

Many large-scale development projects, financed for the most part by multilateral and bilateral donors, have been designed and implemented without regard to their impact on the delicate ecological balances or the complex social systems of resource management and securing livelihood. These include construction of dams as in Jabel el-Awliya in the White Nile Province in Sudan (Horowitz and Salem-Murdock, 1987); creation of irrigation facilities such as the Gezira in Sudan or Bura on the Tana River in Kenya (Mohamed Salih, 1989; Hughes, 1987); integrated river basin development schemes such as the Awash valley Authority in Ethiopia (Gamaledinn, 1987); large-scale resettlement and villagization schemes as in Ethiopia, Tanzania and Mozambique; commercial exploitation of tropical forests as in Côte d'Ivoire and Cameroon. Such projects have intensified resource degradation through disruption of traditional cultivation and grazing systems, concentration of population on limited land, water and forests and changes in the level and direction of water flows.

2.4 Population Expansion

There is a complex relationship between population growth and environmental change. There is a tendency to attribute the main if not total responsibility for environmental damage to rapid population growth. The preceding discussion has identified many other forces which have been operating on the environment in Africa. Thus even when population is the "proximate" cause of environmental degradation, the "ultimate" causes may lie elsewhere, e.g. in inequitable distribution of resources, inappropriate macro economic policies or droughts, conflicts and wars (Shaw, 1989). It is also clear from historical evidence and contemporary experience that major increases in population are compatible with environmental preservation and improvement because of changes in technology, production systems, land tenure and social institutions (Repetto, 1987). For example, several of the most densely populated parts in Burundi, Kenya and Malawi are characterized by impressive practices of soil conservation while some of the more thinly populated regions in the Sahelian countries are faced with formidable problems of desertification. There are also of course some densely populated regions as in parts of Ethiopia and Lesotho which are suffering from acute problems of soil erosion.

It was noted earlier that historically the systems of resource use and management in most parts of Africa evolved in response to a relatively favourable balance between population and resources. This situation is however changing rapidly with the high rates of population expansion experienced in most African countries in recent decades. The population in Africa has increased nearly threefold over the past four decades alone. It is set to double again over the next two decades although these projections may be affected by some of the recent developments such as the spread of AIDS and falling incomes and declining health services.

In the absence of rapid adaptation of technologies, production systems and social institutions, it is clear that population expansion of this order of magnitude cannot be accommodated within the framework of the current systems of resource use and management without a massive aggravation of the environmental crisis.

If the options of migration abroad and employment in the non-agricultural sectors are absent or inadequate, a rapid increase in rural labour force will result in use of the surplus land, subdivision of holdings, opening up of new land through encroachment of forests and grazing land and migration to areas of low potential. These indeed are the principal ways in which increased rural populations in African countries have been accommodated (Bilsborrow and Okoth-Ogendo, 1991). In all these cases the pressures exerted by increased human and animal populations are likely to intensify the processes leading to resource degradation. Significant and long lasting damage can only be averted by an accelerated shift to more intensive and sustainable methods of resource use.

2.5 Alternative Approaches to Conservation and Development

The current patterns of economic development are fundamentally unsustainable in the long run for two reasons. First, they have failed to reduce poverty. On the contrary, the past decade and a half has been characterized by impoverishment of a rising proportion of the population. Second, the past growth patterns have been accompanied by a vast degradation of natural resources. In economic terms this is equivalent to a huge decumulation of capital. It is as if the factory owners use up the machines and buildings in the production process and fail to make provision for their replacement. The degradation of resources amounts to a gradual destruction of the productive base of the economy. By the same token, because the loss in the quality of natural resources is not reflected in prices, any sale of resource-based products, whether in domestic or foreign markets, is inherently subsidized, in most cases from the poor rural producers to more affluent domestic and foreign consumers (Dasgupta and Mäler, 1990).

The move to sustainable development will require wide-ranging changes in property systems, consumption patterns, production methods, technologies, products, institutions and life styles both in the rich and the poor countries. Changes of this nature and magnitude can only be achieved over long periods of time. It is not the intention here to go over this ground which has been covered in a number of well-known reports (Brundtland Commission, 1987; IUCN, 1989).

It is, however, necessary to stress that no conservation strategy is likely to succeed if it does not give a central place to livelihood improvement for the impoverished. This requires wide-ranging changes *inter alia* in access to and use of resources, investment patterns and organization and composition of public services. Changes of this nature are unlikely to be forthcoming without political and economic empowerment of marginalized groups. Thus democracy and strengthening of popular organizations are an integral part of a strategy linking resource conservation with poverty amelioration. The rest of this paper focuses on one critical component of a strategy along these lines: strengthening of the resource management capability of rural producers and their communities and organizations.

3. Conservation, Livelihood and Democracy

This section argues the case for a conservation policy based on local level management of resources, considers some principal obstacles in its implementation and outlines its key features.

3.1 Necessity of a Locally Based Conservation Strategy

A conservation strategy centred on people's participation is supported by compelling logic and impressive evidence (Ghai and Vivian, 1992). The fate of the environment in Africa even more than elsewhere will be determined by the interactions between hundreds of millions of peasants, herders, nomads, forest dwellers and fisherfolk and the natural resources from which they derive their livelihood. They have a greater interest in the health and integrity of environment than any outside parties for their very existence and way of life are at stake. The fact that many of their activities contribute to the impoverishment of these resources is a powerful indictment of the situation they have often been pushed into. One of the principal reasons for this, as argued earlier, has been the breakdown of the customary systems of resource management and the consequent loss of local autonomy and responsibility in this domain.

The indigenous communities have a deep and intimate knowledge of the local ecology, the flora and the fauna, a knowledge born out of centuries of constant interaction with the environment and handed down from generation to generation. In view of the incredible complexity, diversity and specificity of plant and animal habitats, such knowledge and skills are indispensable in evolving responses to changing material conditions to preserve and enhance environmental quality. It is for this reason that few of the interventions from the national and international agencies respond to the real needs of the local people and often end up by doing more harm than good.

The local communities are also in a very good position to assess the relevance and validity of the solutions to environmental problems devised by outsiders. For these solutions and interventions to succeed it is not enough for them to be technically sound. They must also be economically and socially efficient for the small farmer or nomad taking into account their resource constraints and opportunities and respond to their concerns for livelihood security. An effective participation of the local people in devising and implementing programmes and policies for resource conservation provides the best guarantee for the achievement of these objectives. All this is not to argue that outside assistance can make no contribution to resource conservation. As shown later such assistance has a vital role to play but it must be geared to building up of local capabilities and respond to the priorities established by local communities.

The case for reliance on local communities and grassroots initiatives in resource management and conservation is further strengthened by the evidence provided earlier on indigenous inventiveness and creativity in devising environmentally harmonious adaptations in production systems to changes in social and material conditions. There is also abundant evidence of the success of environmental projects which combine external resources with community initiatives and participation (Conroy and Litvinoff, 1988; Egger and Majeres, 1992; Harrison, 1987; Ledea Ouedraogo, 1990; Pradervand, 1990; Reid et al., 1988; World Bank, 1989).

Kenya and Rwanda have achieved major gains in soil conservation and agricultural production through programmes which combined community participation with government commitment and sustained donor support. In Kenya half a million farms had been terraced already by 1985. In Rwanda, communal forests, village nurseries, tree planting and agroforestry have helped to provide fuelwood, fodder and erosion control for the rural poor. By 1985, 63 per cent of the farms were protected by terraces, infiltration ditches or bunds of deep-rooted fodder grasses. Large-scale rural works were undertaken in Ethiopia through peasant associations involving soil and water conservation through terracing, small dam construction, planting of trees and rehabilitation of degraded forests. Although successful in many respects, the programme did not prove sustainable without food aid because of the

excessive extraction of resources from the peasantry to finance wars and the lack of participatory structures with consequent adverse effects on peasant motivation and incentives (Ståhl, 1992).

The importance of community participation is also brought out in the successes achieved in soil and water conservation, vegetable and food crop production and reforestation by Six-S in Burkina Faso and other Sahelian countries; by the mass planting of trees by women's organizations under the leadership of the Green Belt movement in Kenya; and by the successful combination of wildlife conservation with enhanced incomes, employment and local capabilities in the Purros Project in Namibia (Jacobsohn, 1991). It is not difficult on the basis of these and other experiences to isolate the factors which contribute to the success of local level projects. These include meaningful democratic participation by the local people; adequate preparatory period; emphasis on livelihood concerns; existence or creation of community organizations; reliance on locally available tools, materials and skills; low-risk activities with very attractive pay-offs; an effective system of marketing and extension and government and donor support and commitment (Cruz, 1991; Harrison, 1987).

Environmental rehabilitation and preservation cannot however be based on projects alone. By their very nature they can reach only a limited number of people. Their major role is to test new approaches and techniques working in close co-operation with the local farmers and herders. While a lot more can be done to draw lessons from failures as well as successes and to ensure a speedy extension and replication of successful experiences, projects cannot substitute for overall approaches and strategies for resource conservation through people's participation.

3.2 Strengthening Community Resource Management Capabilities

For a participatory approach to environmental conservation to work, a number of changes will be required in the current practices and policies in African countries. These will vary in accordance with differences in ecology, natural resources, social institutions and customary practices between and within countries. However, some key reforms are likely to be relevant across a broad spectrum of ecological and institutional diversity. The first requirement is for a progressive devolution of power and responsibility for resource use and management from the centre to the local communities. Currently, while the formal powers and responsibility are vested in the state and its organs, in reality there is a great deal of uncertainty on the ground about access to and use of resources. The result often is a short-sighted and destructive exploitation of resources. In order to rectify the situation, the powers and responsibilities of the different parties involved - the individual users, the customary authorities, the new local government bodies, the political organizations, the state and the bureaucracy - need to be defined clearly and precisely.

A reform of property rights has to be an integral part of a policy seeking to restore local autonomy over natural resources. The present situation in this respect is unsatisfactory in most African countries. The objective should be to ensure equity in access to resources and incentives for their conservation and improvement. It is necessary to establish clear rules on the access, ownership and use of resources. In some cases, this may require individual title deeds; in others the formalization and effective enforcement of traditional systems of land tenure and use. Under some circumstances, it may be necessary to evolve new property régimes and build new institutions to ensure their implementation.

This approach is illustrated by the Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) in Zimbabwe. The CAMPFIRE programme is designed to smooth the transition from communal ownership of land to more formal structures. Initially the programme will set up an institutional structure to enable local co-operatives to develop

management schemes for land use, wildlife, forestry, grazing and water in specific areas, and to maximize returns from them. The income from these operations will go to subsidized loans for villagers and community investment and for shareholder dividends (Reid et al., 1988; FAO, undated).

The third requirement is for a strengthening of local institutions and organizations. Experience has shown that such organizations are most successful when they consist of people with homogeneous socio-economic backgrounds, evolve democratic and participatory working methods and respond to the priority needs of their members which often concern livelihood security and basic needs provisioning. Such organizations can simultaneously empower local communities, foster grassroots democracy and promote a broad-based development effort focused on livelihood improvement through resource regeneration (Ghai, 1990).

There are many ways of promoting grassroots organizations. In some cases, the traditional groups can be revitalized and given new roles and responsibilities. An outstanding example of this is the Six-S, an association of small peasants, operating in several Sahelian countries (Ledeo Ouedraogo, 1990). Six-S is based on the traditional Naam groups and has pioneered a series of highly successful initiatives on soil conservation, reforestation, water harvesting and turning back the encroaching desert. Reliance upon traditional modes of co-operation is also the basis for the highly successful Organisation of Rural Associations for Progress (ORAP) in Zimbabwe, which seeks to strengthen food security and improve living conditions for poor peasant households (Kempadoo, 1991).

In other cases the village councils or elected local authorities can provide the institutional base for a broad-based effort at improvement of livelihood through resource conservation. This is illustrated by the Mwenezi experience in Zimbabwe (Gaidzanwa et al., 1987). The newly elected district, ward and village authorities pioneered an innovative approach to resource conservation and livelihood improvement comprising land reform, village resettlement, separation between grazing and arable land, creation of fish ponds and protection of wildlife. Sometimes it may be necessary for the local people themselves to create new organizations to take on responsibility for local development. An interesting example is provided by the experience of Utooni in the Machakos district in Kenya (Mutiso, 1991). Starting with an informal grouping of families, the initiative evolved into a complex organization with a membership of 20,000 persons with departments for different activities but retaining a democratic decision-making process. Combining traditional knowledge with modern science, the organization overcame soil erosion and declining yields through terracing, planting of trees and construction of sub-surface dams, water tanks and river barrages. The activities comprise horticulture, dairy cattle, poultry, flour mill, crop storage and pest control, improved sanitation and health centres.

The fourth requirement is to strengthen the technical, organizational and managerial capabilities of rural communities and their organizations. The latter cannot undertake the vast task of resource rehabilitation and conservation without support from sympathetic individuals, organizations, the national authorities and the international community. The positive role played by such external support has been crucial in the successes achieved by many grassroots initiatives for environmental improvement (Ghai and Vivian, 1992). External assistance will be required to solve technical problems, to elaborate programmes for raising labour and resource productivity, to conduct field research and experimentation and to furnish food, materials and cash. But it is important that such assistance should reinforce local efforts, enhance local capabilities, build upon indigenous knowledge and skills and respect community priorities.

Such assistance is in the interest of all parties: the local communities stand to benefit from strengthening of capabilities and improvement of living standards and natural resources, the national authorities will profit from a prosperous economy and reversal of negative externalities generated by resource degradation and the international community will see a progress in the realization of its objectives of sustainable development, preservation of global environment and conservation of the unique forest and wildlife resources of Africa.

3.3 Democratic Reform and Environmental Conservation

The existence of participatory initiatives with a successful record in resource and livelihood improvement shows that the approach set out above is feasible and viable. The failure of this approach to spread rapidly to embrace major parts of the region is an indication of the formidable difficulties encountered in transforming it into national policy. Apart from problems of finance, technology, knowledge, skills and organization mentioned above, there are serious problems of a political nature.

The transfer of power, responsibilities and resources to local institutions and organizations runs into powerful vested interests at many levels. These include politicians and bureaucrats at the centre, commercial enterprises and even international agencies and bilateral donors. The difficulties are further compounded in many situations by the existence of sharp inequalities in wealth and organizational and political power at the local level. The objective of resource and livelihood improvement cannot be achieved if the transfer of power and resources from the centre results in further accentuation of inequalities and marginalization.

The existence of democratic space at the national level and freedom of association for all groups are crucial to the success of a locally based strategy of resource conservation. Recent democratic reforms in a number of African countries provide a favourable setting for the multiplication of grassroots initiatives and movements. Ultimately it is the presence of strong, democratic and self-reliant organizations of rural producers and their communities which alone can ensure equitable and sustainable patterns of development. A primary objective of an environment policy must therefore be the strengthening of such organizations.

In view of the difficulties outlined above, the progress in implementing a locally based conservation strategy is likely to be slow and halting. But there are also a number of considerations which provide a favourable context for the adoption of locally based strategies. These include a growing perception of the social and ecological unsustainability of present patterns of development, heightened awareness of the disastrous consequences of environmental degradation at local, national and international levels, mutuality of interests in environmental integrity among different sectors and social groups from the local to the global levels and a powerful global momentum for democracy and human rights.

4. Conclusion

Environmental degradation in Africa is widespread and continuing. It is undermining the productive potential of the region thus threatening the livelihood security of scores of millions of peasants, herders and forest dwellers and creating serious ecological problems at local, regional and perhaps global levels. A number of processes have contributed to environmental deterioration. At different periods and in different zones, these have included expropriation of resources, breakdown of the customary systems of land use and management, commercialization of agriculture, rapid population expansion, inappropriate macro policies and ill-conceived infrastructural and settlement schemes.

The past policies to rehabilitate and conserve degraded resources have for the most part failed because they neglected the social dimensions of the environmental problems the solutions to which were seen largely in physical, ecological and technical terms. There is

growing evidence that a holistic approach sensitive to people's problems and priorities can successfully combine resource conservation with livelihood improvement. A key element of this approach is the progressive transfer of responsibility to local communities and organizations for the management of natural resources. The national authorities and the international community can play a vital role in this process through assistance designed to reinforce local efforts, enhance local managerial and organizational capabilities and build upon indigenous skills, knowledge and inventiveness.

An approach to sustainable development based upon local management of natural resources faces enormous difficulties of conflicts of interest amongst different groups at local, national and international levels. But there are also common interests among diverse groups and organizations in poverty alleviation, preventing the disastrous ecological consequences of resource degradation and initiating a process of environmental rehabilitation and preservation. The current struggle for democratic reform in Africa provides an exceptional opportunity for expansion and strengthening of grassroots organizations of rural producers - a crucial component of a locally based approach to sustainable development.

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