

## **COPING WITH AFRICAN DROUGHT**

*The 1983-85 drought which afflicted Africa's dry lands has been alleviated by two years of better rainfall in Ethiopia and Sudan, but persists in southern Africa. In the north, attention has turned to drought-recovery measures: control of locusts, replenishment of food reserves, reconstitution of herds, soil rehabilitation and improved early warning. These efforts provide a chance to review the lessons learned from 1983-85, and to assess strategies for coping with drought. Are there feasible technical solutions other than a mass exodus of people and animals which would permit development within Africa's fragile dry lands? What room for manoeuvre exists for their rehabilitation and future use?*

### **Types of African Drought**

The drought of 1983-85 was a repeat occurrence of the earlier 1968-73 drought, which severely affected several West African countries lying along the southern margin of the Sahara in what is known technically as 'the Sahel' (the area receiving between 100 and 600mm of annual rainfall). The human impact of the 1970s drought was so catastrophic that it became known as the 'great Sahelian drought', and it stimulated an outpouring of international assistance to the Sahelian countries. Then, in 1983-85, came another widespread drought-induced crisis, this time centred eastwards in Sudan and Ethiopia. Despite all efforts during the intervening decade, again many people died, perhaps as many as half a million. And drought has continued to plague the economies of Botswana, Mozambique and now Somalia.

### **The Single Season Drought**

Most African countries can mobilise sufficient assistance to survive one or even two seasons of drought. Such droughts can be thought of as 'normal' in Africa's drier lands where alternating periods of famine and plenty are usual. Locally, people have long since evolved their own strategies for coping when the rains fail. A good example was the failure of Kenya's 'long rains' in April-May of 1984. This event was the second most extreme of this century, but with the return of ample 'short rains' later in the year and with vigorous governmental intervention, most Kenyan peasants survived without too much dislocation. Long term records suggest that failures of one or two seasons in sequence have occurred many times in the past, interspersed with times of above-average rainfall.

Policies for coping with droughts of this nature are based on recognising the riskiness of agricultural production and learning how to outlast the one- or two-season failure. Countries which straddle several ecological zones (such as Nigeria, Sudan, Ethiopia, Kenya and Tanzania) have the advantage that even in dry years they may have some food-surplus regions. In the long-run, if they follow sound

policies and acquire the necessary infrastructure, they ought to be able to keep most citizens fed even in occasional years of drought.

### **The Multiyear Drought**

The picture changes when drought persists year after year, as it did for a nearly unbroken sequence of sixteen years of gradually diminishing mean rainfall in the West African Sahel from the late 1960s onwards. Few agrarian economies can survive more than about three successive bad years without external help. Zimbabwe encountered three bad years between 1982-84, and despite having black Africa's most commercialised economy would have exhausted its options had the drought continued.

Many commentators at first interpreted the 'great Sahelian drought' of the early 1970s as if it had been a 'normal' event of the kind encountered by Kenya in 1984. There was much talk of environmental misuse and inadequate governmental responses. Regimes were overthrown in Niger and Ethiopia because of their inability to cope with the unfolding drought. However, in retrospect it appears that the 1970s may have witnessed a shift towards a drier climate (Box 1). For example, at El Fasher in Sudan during the decade after 1965 there were only two years when rainfall reached the long term mean (of 289mm); the totals for 1972, 1973 and 1975 were the lowest on record to that point. Such a shift means basically that the land can no longer support settled farming. In fact Sudan's semi-nomadic Zaghawa pastoralists were forced to abandon more than 400 villages in Darfur when their millet harvests failed year after year.

A similar pattern can be seen in the 1983-85 drought. By early 1984, Sudan's Red Sea Hills and neighbouring parts of Eritrea and Tigray in Ethiopia had already experienced four or five bad years in a row. Despite their great ingenuity, peasants had no food left. August should have been the rainy month in this part of northeast Africa. But in August 1984, the capital of Tigray received just 68mm of rainfall compared with its long-term mean of 205mm; nearby Welo region (with a mean of 265mm) recorded only 44mm. A total failure on this scale following several bad years can escalate quickly into a major social and economic catastrophe — just as it did in late 1984 until finally an international response was mobilised.

Such trends are atypical if judged against recorded rainfall for this century. Those who stress that these major droughts are 'normal' for Africa's arid lands are employing a much longer time perspective than policy-makers usually do. There is evidence (Box 1) that Africa has experienced extended periods of drought in the distant past. The warning is that any long term shift towards more arid climates on Africa's vulnerable, dry lands would undermine the fragile economic recovery achieved to date.

### Box 1 Has Africa's Climate Changed?

The extended 'Sahel Drought' of the early 1970s was widely seen as a single, unusual event. Recent longitudinal analyses of rainfall data show instead that the 16 year downward trend in mean annual rainfall which commenced over the Sahel in the mid-1960s was unprecedented in this century. This opens up the possibility that Africa is experiencing a shift towards a more extreme climate.

The grounds for taking this 'worst case' scenario seriously are threefold. First, historical and paleoecological evidence indicate that Africa has experienced more extreme droughts in the distant past. The drying up of Lake Chad in its interior basin, past failures of the Nile's flood and the presence of 'fossil' sand dunes within currently vegetated areas all suggest a shift towards a more arid climate is a definite possibility.

Second, the location of Africa's recent droughts — the Sahel, Sudan, northern Ethiopia, Somalia, Botswana and parts of Zimbabwe and Mozambique — lie on either side of the equator along the northern and southern margins of Africa's better watered lands. This is precisely where such deficits would be anticipated under a shift towards increased continental aridity.

Third, most climatologists see temperature differentials between the tropics and the earth's colder areas as the engine which ultimately causes moisture to circulate through the atmosphere. If increased carbon dioxide accumulation (or any other influence) should lead to a predicted worldwide 'hothouse' effect, temperature differentials would diminish and African countries would experience dramatic changes in the continental distribution of rainfall. Specific correlations have now been documented between mean ocean temperatures and the Sahelian drought. It seems that in years when the difference in temperatures of oceans north and south of the equator narrows, the inter-tropical convergence zone which triggers rainfall over Africa is compressed. While some areas nearer the equator may receive more rain, moist air does not travel as far north. This leaves the Sahel and Sahelian-Sudanic zones with insufficient rainfall for farmers' crops and animals.

### Less Room for Manoeuvre

Observers agree that in recent years the impact of African droughts appears to have been more severe than climatic conditions alone have warranted.

### Indigenous Ways of Coping

The Sahel's past ability to support comparatively dense human populations despite recurrent droughts rested on several adaptations. First, those keeping livestock on lands too dry for plough farming were accustomed to adjusting their composition of herds between sheep, goats, camels and cattle to suit different environments. By moving seasonally to distant grazing on lands too dry for permanent occupation, African pastoralists safeguarded higher potential home ranges which sustained their herds during the long dry season. Second, there was widespread trading between livestock keepers and farmers, who grew hardy grains like millet and sorghum on lands just to the south of the true Sahel. Local communities stored their own grain after harvest, trading some to pastoralists but keeping back enough to outlast a typical dry season. Third, many families were involved in seasonal labour migration, trading, or craftwork which provided extra income. Fourth, farmers and pastoralists knew how to employ wild

foods from the 'bush' which still existed around many settlements. Fifth, pastoralists who had lost their animals might temporarily take up hunting, fishing or farming until they could rebuild their herds. Sixth, in a prolonged crisis a household could migrate into the better watered lands lying to the south. When major droughts occurred, the habitable zone along the margins of the Sahara would be compressed southwards, followed by an eventual recovery when 'normal' seasons returned. Finally, some groups organised themselves militarily to expand their territory or to raid their neighbours for replacement animals.

The historical record shows that in both West and East Africa there have been numerous past crises from which the indigenous economies eventually recovered: rinderpest, smallpox and cholera epidemics; extended droughts; the incursion of rival groups; and the spread of sleeping sickness. Historians think that it took only 10-15 years for Niger's nomadic Fulani to recover from the great rinderpest epidemic at the end of the last century — a recovery matched by the Maasai and Samburu in East Africa who experienced a similar disaster. While people suffered severe hardship during such events, recovery by indigenous means did occur afterwards.

A worrisome feature of the last two major droughts has been that for many people recovery has often not taken place. Among the Wodaabe Fulani of Niger, sociologists found many poorer households were unsuccessful when employing traditional mechanisms to recover after the 1968-74 drought. Among the Turkana of Kenya, who suffered the combined disaster of a major drought and military raids in 1979-80, many were still destitute and subsisting on famine relief five years later. This loss of resilience has been most marked among the poorest, who have the least resources to act as a buffer against adversity.

### Effects of Commercialisation

There are two main explanations for the increasingly precarious nature of food security. The first is the *commercialisation of agriculture* in a high risk environment. Throughout the Sahel, farmers have added export crops like cotton or groundnuts to meet their household's cash needs. Where crops are hand cultivated and the rainy season is so short, the addition of export crops means in effect planting less food during the brief period when moisture is sufficient for growing crops at all. Cereals no longer stay in the compound or village. Much of each season's crop is quickly sold to meet pressing cash needs at harvest, when prices received will be low. Later, when people are short of food after a long dry season, they must buy it back at high prices and in competition with more affluent consumers who live in less drought-afflicted areas. The land devoted to these export crops would otherwise have been the dry season grazing for livestock, whose manure was critical to the maintenance of grain yields.

Pastoralists who usually moved into drier lands during the rains found increasingly upon their return that vital, dry-season pastures had been taken over by farmers (or for other purposes such as irrigation schemes, state ranching, and game parks). The long-run impact of this trend was masked initially since the 1950s and 1960s saw a run of wetter than average years. With a rising population on Africa's better watered lands, there was rapid expansion of arable farming into what had been rangelands. Livestock producers were mollified by the provision, at public expense, of better disease control and deep wells enabling them to stay permanently within seasonal grazing areas. Despite losing between perhaps a third to one half of their better ranges, they built up their herds well above earlier levels.

## Overutilisation of fragile lands

A second explanation for reduced food security stresses *the effects of human mismanagement*. The underlying idea is that African environments can no longer support their human and animal populations in the dry years when the carrying capacity of the land falls off so catastrophically. Few farmers can afford fertilizer, relying instead upon natural vegetation to restore soil nutrients and structure through extended fallows. But with too many people, the fallow periods have become shorter and shorter until no restoration of soil condition occurs. Having too many animals has meant a loss of the palatable grass and browse species, and a compaction of the land surface which encourages rapid runoff when the rain does fall. Surface erosion then strips away the valuable topsoil. In turn, declining yields from animals and plants force farmers into adopting still more exploitative techniques until finally only useless hardpan remains. Meanwhile the changed reflectance of the ground surface (the so-called 'albedo effect') and the increased dustload in the air alter the atmospheric relationships which bring about convective rainfall. A negative feedback cycle comes into play, whereby the immediate impacts of a dry year are accompanied by human practices which prolong and intensify drying-out of the environment. Many commentators have adopted this 'man caused' viewpoint to explain the adverse impacts of the recent major droughts.

This intensified land use sets in motion during the drier years what has been termed a 'tragedy of the commons'. Most African pastoral systems allowed members open access to grass and water. Individual herd owners were not in a position to realise the benefits from conserving these essential resources. Instead, producers tried to accumulate large herds to survive occasional droughts and to have surplus animals for sale. With grass and water available to all but becoming in short supply as a drought commenced, those who used these scarce resources heavily stood to gain the most, even though by so-doing they compounded the scarcity encountered by the whole group.

The exploitative use of drylands has been exacerbated by other changes. In the past, shortages of water usually forced herds to move before grass and browse were irretrievably overgrazed. Now deep wells allowed herds to remain on what had been seasonal pastures. By the time in a season when pastoralists feared the loss of their animals, the prices they could receive for stock in the marketplace had collapsed, while grain often was not available. The extremely adverse terms of trade between livestock producers and grain traders during periods of drought meant that pastoralists would be stripped of their productive assets at throwaway prices, if indeed their animals did not die first. So producers' enforced reliance on high risk pastures has left pastoralists especially vulnerable during extended droughts when local markets can neither absorb stock nor supply food at fair prices.

The 'tragedy of the commons' scenario probably overstates the impact of pastoral land use while understating deterioration caused by settled farming, or 'sedentarisation'. For example, ecological research on Kenya's Ngisonyika Turkana found that households which remained within the traditional pastoral economy survived the severe 1979-80 drought without either experiencing evident environmental deterioration or themselves becoming pauperised. However, those pastoralists who never recovered their herds after the 1970s drought, or who had lost them through raiding, suffered greatly. The linkage between African drought and differentials in ocean temperature (Box 1) also casts doubt on the role of African

pastoralism as a primary cause of the continent's environmental crisis. When the 1984 drought became prolonged, pastoralists who could move to less stressed pastures promptly did so. An aerial census in a drought-affected section of Niger found that the population of cattle declined from 376,500 in October 1981 to just 44,400 in September 1985. Nobody knows where the cattle went, but it is certain that they were not present after the drought reached its climax.

The final stage in environmental misuse occurs when people destroy the trees and shrubs which might otherwise provide dry season forage to their herds. During 1983-85 in Darfur and Kordofan, Sudanese peasants who had lost their herds and crops finally cut down their trees to make charcoal which could be sold to urban centers. So also did the Beja peoples living in Sudan's Red Sea Hills, where because of desert conditions trees had been highly valued. Researchers in Kenya have found that when former pastoralists are settled, their annual consumption of wood (used for cooking, huts, fencing and charcoal making) goes up fourfold. A World Bank review of desertification in West Africa suggests that shortages of firewood and energy rather than of crops and livestock are the most limiting factor determining the population carrying capacity in Africa's dry lands.

## Solutions that didn't work

After the 1983-85 drought external donors had the disturbing realisation that the array of expensive technical interventions adopted after 1975 had made little positive difference. The six most drought affected Sahelian nations (Senegal, Burkina Faso, Mali, Mauritania, Niger and Chad) banded together in 1973 to form an intergovernmental committee to combat drought, known officially by its French acronym, CILSS. The western donors responded in 1975 by establishing their own parallel grouping, the Club du Sahel linked to the OECD in Paris. In combination, the CILSS/Club du Sahel identified some 714 projects in ten sectors, which constituted their first generation programme for combating drought (1977-82). Of the \$3.3 billion so targeted, the largest single amount (nearly one-third) was reserved for irrigation development. Other types of projects included ranching, afforestation and land rehabilitation.

## Irrigation

The poor performance of irrigation during the recent drought requires further explanation. In a major drought, rivers dry up and the water table falls. The World Bank's irrigation projects along the River Niger in Mali and around Lake Chad in northern Nigeria lost their expected supply during this last drought. Furthermore, African countries have tended to use irrigation to grow mainly rice, wheat, cotton and sugarcane. Such crops are produced under high subsidies; one Nigerian study found that Nigeria's irrigated wheat costs about eight times what it would if imported. Away from the West African coast, rice and wheat are mainly consumed in towns, so that expensively produced tonnages have not greatly increased rural food security. Over-bureaucratic organisation, soaring costs, and unresolved technical problems have negated the positive benefits hoped for from irrigation.

## Afforestation

Officially-sponsored afforestation has been equally problematic. After the 1970s drought, forestry departments, donors and NGOs established a huge number of tree nursery projects scattered over the Sahel. Windbreaks of fast-growing species were planted at hundreds of sites. Food-For-Work recipients have planted out thousands of nursery seedlings. Yet perhaps five trees in a hundred survive. A combination of neglect, fire, drought, grazing by goats and wilful destruction killed the rest.

## Range Development

There were also hopes in Mali, Niger, Ethiopia, Somalia and Botswana that adoption of modern range management could stimulate a commercialisation of traditional herds. Donors like USAID, the World Bank and the UNDP sponsored several ambitious range projects. Without any exception, these all failed. Richer producers welcomed opportunities offered by external projects but continued to keep surplus animals on the commons. Poor producers were rebuilding herds decimated by the earlier drought or kept smallstock and camels not included in project plans.

## Soil and Water Conservation

Perhaps the most unexpected setback, however, has been the disappointing performance of soil and water conservation measures introduced for environmental rehabilitation. It was hoped that techniques derived from Israel and South Arabia for water spreading and water harvesting might permit successful farming despite increased aridity. Thousands of food-for-work recipients were pressed into constructing terraces and massive earth bunds intended to retain and conserve both water and valuable topsoil. Many of these structures were destroyed within the first few seasons, sometimes by localised thunderstorms and also because people failed to maintain what they had built.

## General Lessons

Any impartial observer must be dismayed by the meagre results achieved from such a large investment of resources intended to combat drought. There are several clear lessons:

First, many countries are still only *poorly prepared to cope* with a sequence of bad years. To counteract its single season 1984 drought, the Kenyan Government imported 1.5m tonnes of grain. For poorer countries like Mozambique or Somalia with neither Kenya's productive agriculture nor its infrastructure, the current drought is having devastating local impacts.

Second, drought *cannot be fought only within the driest zone*. The trees being cut supply the energy needs of distant urban centres. The disappearance of cereals from remote markets occurs because those in the densely settled Sudanic zone are also short of food. Any effective approach to alleviate the impacts of drought must look at population pressures and food availability within all zones.

Third, in the absence of governmental interventions people may be forced to *destroy their own productive resources while attempting to survive*. It is the rapid loss of

### Box 2 Politics and Drought

Political decisions have greatly increased the severity of drought impacts in Africa. One difficulty has been the unwillingness of national leaders to admit they can no longer keep citizens fed — the problem in Sudan during much of 1984. Similarly, Ethiopian officials in early and mid 1984 were preoccupied in organising the celebrations of the tenth anniversary of their revolution, making it doubly difficult to admit a crisis had developed. Since inter-governmental transfers of food aid depend upon a formal request for assistance, failure to admit a crisis can greatly delay the organisation of effective response. In the Ethiopian case, there was the added political complication that western donors objected to Ethiopia spending hard currency to support military operations in the very areas (Eritrea and Tigray) where the drought was most severe. Potential donors may suspect a country has sufficient food in reserve or that aid would be diverted (perhaps explaining the slow USAID response to Somalia's claim in May of 1987 that 12 of its 18 regions were experiencing severe drought affecting five million people).

Another difficulty for landlocked countries arises if their neighbours close their borders (as Nigeria did during the last drought) or if they forbid export of cereal grains (as Niger did to drought afflicted northeastern Mali).

Probably the most severe impact of a drought occurs when it coincides with military conflict within the countryside. Both the national regime and local insurgents have an incentive to channel food to their own forces while denying it to communities they suspect of supporting the other side. Peasants may lose their animals and foodstocks to guerrilla forces, while the unsettled military situation makes it impossible to bring in relief food.

An example is provided by Mozambique, where the economy has experienced five years of severe decline in earnings brought about by the South African backed MNR insurgency. In late 1986, three columns of MNR troops moved into northern and central Mozambique in an apparent attempt to take two provincial capitals and to hold the territory around them. These actions have coincided with a failure of the rains over southern Mozambique, leading to a national food deficit of at least 465,000 tons of cereals at a time when some 1.5 million people are hungry and there are hundreds of thousands of refugees arriving out of the bush to take up residence in the more secure areas. Though the drought would have been difficult, in the context of an externally backed insurgency it is having a catastrophic impact upon Mozambique's economy.

their trees and herds which renders people so vulnerable and their eventual recovery so slow.

Fourth, *political factors* (Box 2) have compounded the sufferings of those experiencing drought, because governments have been unwilling to act soon enough, have closed their borders, or because military conflicts have destroyed the capacity for community action.

Fifth, most of the remedies implemented after the Sahelian droughts of the early 1970s *failed to protect people* once severe drought returned. Governments soon forgot the lessons of the recent past, and failed to see that drought relief measures were effectively implemented and maintained. In 1983-85, it was again the international political economy of famine relief drawing on food

reserves in Europe and America which bridged local food deficits to keep Africa's poor people alive.

## Policy Options for the Future

The gap between intentions and performance during drought and the possibility that Africa may be entering a period of more frequent droughts underline the need for a rethinking of government and donor policies. What should African governments do in the future?

### Policies versus Projects

In searching for ways of reducing the impact of droughts, African governments and donors have leaned towards technological solutions. Donors continue to search for 'success stories' as models to replicate throughout the Sahel. However, technological packages should not necessarily be a nation's first concern when deciding how to combat drought. Analysis of a country's *strategic response* ought to precede the promotion of individual technological cures. Issues to examine include: policies towards industrialisation; whether free migration is permitted across national borders; the impact of accepting food aid on local producers; the comparative advantage of farming or animal production in high risk environments; and the foreign exchange costs of any solutions adopted.

National strategies must also deal with the possibility that Africa is undergoing a climatic change. Such a shift would mean that farmers require drought tolerant crops and short season varieties. There would be higher risks of crop failure, which would make loan financed development projects less attractive.

Poor tropical countries are not well equipped to reorient existing research and extension efforts towards more suitable policies and projects. With a continuing budgetary crisis and low commodity prices, many countries are struggling simply to maintain existing commitments. Nevertheless, if they do not make the effort, they will become increasingly dependent upon external food relief whenever adverse seasons are experienced. The poorer farmers and destitute ex-pastoralists living in Africa's semi-arid zone are already well on their way to becoming the welfare clients not only of their own regimes, but also indirectly of the EEC and USA. During the last decade, 'food for work' has become the main livelihood within many of Africa's poorest communities — a development neither African governments nor developed countries intended.

### Promising Interventions

Supposing that countries decide they require better projects, what types are the most promising?

1. *Getting people back into farming.* The first item on the agenda is to minimise the time people spend in food relief camps. Giving out relief food to those near distribution points perpetuates their dependency at a time when rainfall would permit a return into farming. Instead farmers need seed and a ploughing team. In Ethiopia, for example, to overcome the shortage of plough oxen after the 1983-84 drought, scientists experimented with a new type of plough which could be pulled by a single animal. A government must be prepared to move quickly and effectively after a drought to forestall the emergence of long-term dependency.

2. *Restocking ex-pastoralists.* A really severe drought will result in many pastoralists losing all their animals, making it impossible for them to re-enter livestock production. Herd dynamics are such that once all the breeding animals are gone, it takes a long time before productive herds can be re-established. However, in countries with diverse ecologies or a substantial irrigation sector, many animals may have been moved out of the drought zone for purchase by households with other sources of income. Here the possibility exists for a redistribution of animals back into the hands of now destitute ex-pastoralists, ie. 'restocking' or 'herd reconstitution'. Restocking does not as such contribute to 'overstocking' in fragile rangelands: the animals are already present, but the aim of a restocking program is to obtain their redistribution into smaller herds which can support the very people who formerly owned and managed them.

3. *Establishment of cereal reserves,* either locally or at district and provincial levels is once again being widely stressed. Several NGOs have projects for community 'seed banks' to ensure that poorer farmers have access to seed when needed. Nationally, some countries now attempt to hold back sufficient grain in storage to outlast seasonal shortfalls, a stock which can be diverted to remote areas in a major drought. Economists question whether this is cost-effective, given the ready availability of EEC food grains on concessional terms. Nonetheless, timely local access to cereals is vital to forestall the asset stripping which otherwise can occur in marginal areas once a drought is underway.

4. *Marketing improvement* represents a complementary approach. In several African countries cumbersome parastatals which attempted to market food grains under controlled prices have been dismantled. Instead, incentives in the form of better transport, credit and storage have been made available to encourage the private sector to handle grain and livestock more effectively. The goal is to return higher prices to producers while buttressing the terms of trade in times of general scarcity.

5. *Small-scale water harvesting* continues to have an appeal, since better management of water remains essential for any technological revolution in food production. In place of massive terraces and earth bunds, specialists now recommend 'micro catchments' which conserve rainwater near where it falls. Recent research from the Negev indicates the importance of capturing water at mid-slope high in each catchment, and there are now low-cost technologies for achieving this objective (rock bunds laid along the contour and small, runoff pits for individual trees). However, all such measures must be understood by farmers, who should select the sites and species themselves.

6. *Community managed irrigation* has replaced large-scale projects run by government agencies as the focus for donor aid. It is now recognised that farmers must have a stake in the technology, should choose the crops to be irrigated, and are more likely to maintain systems which they themselves own. More attention is being given to designing projects which farmers can manage themselves either through user associations or their own committees. The spontaneous spread of privately purchased pumps indicates irrigation is still popular when provided in a sustainable form.

7. *Social forestry* is replacing afforestation. The dismal survival rates from hundreds of thousands of nursery seedlings planted out under external direction makes it plain that people must want to use and conserve trees before afforestation will occur. Under a social forestry approach, trees are introduced within the farming system

as a crop owned by households or by villages, thereby ensuring the trees will be cared for. Indigenous types which are leguminous and which have multiple uses at different growth stages should be preferred. New systems of 'alley cropping' allow farmers to plant food crops between tree rows, perhaps followed by forage for livestock once food crops are harvested.

8. *Early warning systems* at national and international levels are being established to indicate in advance when a major drought appears to be developing. Achievement of this capability is vital, since even under the best circumstances it takes time to organise food relief. In countries with poor communications and a cumbersome bureaucracy, an early warning of impending drought is critically important. However, the slowness of governments and donors to respond in 1983-84 was in part caused by a lack of faith in the information being received. More work is required on the technology for early warning, to improve its reliability and extend the lead time it provides.

9. *Resettlement of populations* outside the most drought affected zones has been advocated by scientists. The largest numbers of deaths in the 1983-85 Ethiopian drought took place where people had been squeezed out of higher potential areas to farm on marginal lands with a high risk of crop failure. As it happens, the Ethiopian government did respond by moving peasants away from the drought-prone north to new locations in the south. This policy caused much hardship, and became highly controversial. The question remains open whether employment of other incentives might encourage a gradual redistribution of people into areas which can better support them.

## Conclusion

These measures for ameliorating drought impacts have several features in common. They are mainly low-cost innovations employing relatively simple technologies that usually do not depend upon imported inputs. They appeal to farmers because they address real problems within the production system. They can be promoted in the community, and do not require a large administrative superstructure. Many observers agree that the necessary innovations can be promoted most effectively by changing the pay-off matrix: making it profitable for farmers to farm

in a way that is in their own long term interest. There are technologies at hand which meet this objective.

This optimistic observation echoes the arguments put forward in Harrison's *The Greening of Africa*. A shift in emphasis away from bureaucratically initiated and controlled large projects should be welcomed. Even so, the underlying message of this review has been that there is very little room for manoeuvre. The direct transfer of foreign technologies into African practice has not yielded happy results, while the institutional system is still strongly biased towards operating through bureaucratically implemented projects. Many African leaders (and external donors) retain a preference for the very modes of operation which have so often failed in the past. Governments have not learned how to go about promoting small-scale irrigation, livestock development and social forestry. They are also unlikely to maintain the necessary innovations during the years between recurrent drought crises. It will take a great deal of further experimentation working with farmers and concerned scientists to find effective and lasting remedies for the 'normal' droughts African peasants may increasingly encounter.

## For Further Study

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