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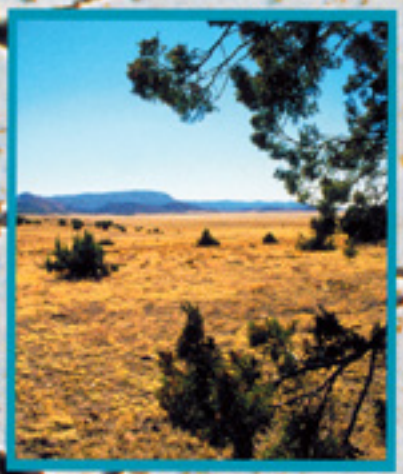

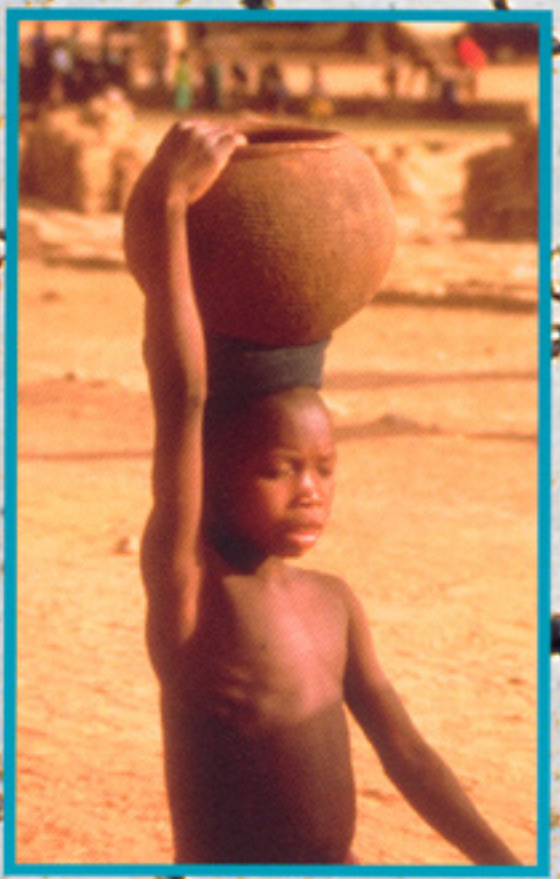

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The World Bank Drylands Management website:
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Executive Summary

The objectives of this study are to analyze and synthesize the experience of the World Bank and other agencies in drylands management, with a special emphasis on Africa. Recommendations are provided on "good policies and practices" in drylands management that can support actions to fulfill obligations arising from the United Nations Convention to Combat Desertification (CCD) for member countries and for international organizations, such as the World Bank. The paper looks at "good practices" in the management of rangelands and dryland farming, pastoral development, community-based natural resources management, and drought preparedness.

Drylands management has to a large extent been seen as a defensive battle: a struggle to protect and conserve dryland resources from degradation—a combat against desertification. Although there are environmental resource problems threatening the livelihood security of people in the world's drylands, there should perhaps be more focus on possibilities, not just on problems. This paper points to many possibilities for increasing the productivity of drylands. A doubling or fourfold increase or more of yields should be within reach in many areas. To be sure, many obstacles and constraints first need to be passed or removed.

Perceptions of "desertification" and land degradation have changed considerably over the last decade. The most alarming reports of growing deserts, deforestation, and soil loss were found to have poor empirical foundation. Land degradation does occur, but much of the vegetation change observed can be attributed to long-term fluctuations in rainfall rather than human resource use. The drylands have a high degree of resilience to human interventions. Dryland populations have developed well-adapted and efficient resource management and utilization practices. These findings have important implications for "good practices" of governments and donors wanting to intervene in improving drylands management. It is, nevertheless, important to recognize that large gaps exist in the understanding of dryland ecosystems and the interaction of society and ecology.

Whereas governments in countries "affected by desertification" may have hoped that the CCD would provide new and additional financial transfers from the North, the convention placed primary responsibility for action with the governments themselves. Effective action to improve the livelihoods of drylands populations while preserving the natural resource base requires government commitment, political will, and capacity. These are frequently lacking. Environmental issues, including the follow-up of the CCD, are often the domain of specialized environmental agencies, with little impact on macroeconomic and sector policies. For environmental concerns to be better integrated into economic policymaking, it is also important that country environmental agencies—as well as environment or natural resource sections of donor agencies—are able to show more clearly how environmental quality and natural resource use practices affect welfare and economic development.

Participation by drylands communities is crucial to improved drylands management. If policies and practices of governments and donors are to succeed, they must be based on the knowledge, aspirations, desires, priorities, and decisions of the people living there. These communities have strong interest in the preservation of the resources that provide for their survival, but they are often constrained by inappropriate government or donor policies.

Pastoral Resources Management

Large areas of the drylands that are too dry for crop cultivation can best be utilized by pastoralists. For projects aiming to assist pastoralists' resource management the following points have been identified as of particular importance:

- Ensure the flexibility and mobility of pastoral herds, which is critical to "opportunistic range management" and the success of these systems. Provide ac-

cess to dry-season grazing and drinking water for livestock.

- Address knowledge gaps between local perceptions and those within governments, donors, and researchers on ecological dynamics and social issues.
- Start small and expand through careful phasing of inputs and support for capacity building, including civic education and information, advocacy, and skills for non-land-based or urban employment. Move on to broader aspects of natural resources management with time.
- Foster a diversity of organizations at different levels and for different purposes—customary, mixed, nongovernmental groups, private entrepreneurs, local government, state agencies.
- Authorize local users and leaders to take responsibility.
- Identify ways of increasing drought preparedness and managing drought.
- Develop and provide low-cost veterinary services.

Improving Dryland Farming Practices

The process of creating a more sustainable and productive agriculture requires public action along many fronts. Many of these are not usually conceived of as being part of the agricultural sector. Thus improved education at all levels will play a vital role, as will increased investment in research and extension and in infrastructure. Also important are factors such as a stable macroeconomic situation, a conducive legislative framework, and maintenance of the rule of law. Strengthening markets is crucial to agricultural development.

More work is required in developing technologies that may increase agricultural productivity in the drylands while preserving the resource base. Solutions have to be appropriate to farmers' needs and constraints. They will have to be low cost—especially in terms of purchased inputs.

Soil fertility depletion is considered to be the fundamental bio-physical cause of declining per capita food production in Africa. Integrated nutrient management (INM) practices will thus play a key role in increasing yields. INM is based on the following principles:

- Maximize the use of organic material
- Ensure access to inorganic fertilizer and improve the efficiency of its use
- Minimize loss of plant nutrients.

The best INM practices nearly always involve a combination of organic and inorganic sources of fertilizer. Even when the mechanism of nutrient transfer from rangeland to arable land by livestock manure is used optimally, organic materials can only substitute for a part of the nutrients removed with the harvested product. They are, however, important for maintaining soil quality. Increasing fertilizer use will have to play a pivotal role for increasing production in dryland areas. In

Africa, use is currently extremely low because of high farm gate prices, low availability, and inappropriate extension recommendations. Methods for increasing the productivity of fertilizer need to receive special attention. The yield effect of fertilizer use can be greatly enhanced by, for example, point application.

Further development of water harvesting and irrigation is key to increasing agricultural production in dryland areas. Less complex, small-scale irrigation schemes managed by individual farmers or by communities very often appear to be more viable than large schemes.

Livestock are of crucial importance to drylands agriculture. A diverse species composition of herds is one of the main strategies of risk management. Increasing the availability of fodder and its quality is important in all types of sedentary livestock production systems. To increase the productivity of pastures in areas with sedentary farming, animal husbandry needs to move toward controlled grazing and zero-grazing. This can contribute both to increased animal production and to increased supply of farm yard manure. Higher quality feed may also enhance the quality of the manure.

Community-Based Resource Management

Efforts to develop community-based resource management regimes in farming or agro-pastoralist societies have many features in common with pastoral institution building. There are, however, some unique features. The basic elements of good practice include:

- Building a solid information base on the dynamic relationship between resources, community actors, and external arrangements
- Assessing the transaction costs involved in various operations and for various activities and stakeholders in order to get a more realistic view of what total project costs are in relation to potential benefits
- Responding to and targeting investments to local priorities through participatory and continuous dialogue
- Addressing immediate problems first (such as production technology and social services) and letting solutions to more complex and long-term problems emerge from below over time (such as capacity building, land tenure, social infrastructure, and decentralization)
- Addressing risk and uncertainty in face of drought and desiccation related both to individual households and communal drought-preparedness
- Addressing land degradation from the perspective of the local stakeholders—both on individual farms and related to common-pool resources
- Broadening the scope of agricultural extension to encompass environmental and civil education concerns related

to information about decentralization, land rights, democracy, and human rights
- Developing into a national program whenever feasible in order to enlarge the possible impact, but concentrating on zones where key resources, key degradation problems, or important conflicts occur and willing and capable communities are found
- Ensuring that interests of marginal groups or pastoralists are taken into account
- Introducing national training and information programs for staff and local people to show how community-based development can accompany and reinforce the decentralization process and foster systematic institution building and commitment
- Involving other sectors more effectively at national, regional, and district levels to complement drylands management (such as decentralization and participation within the livestock and extension services).

Drought Preparedness and Risk Mitigation

Drought is a "natural" feature of drylands, especially the more arid zones. Linking drought preparedness to overall development strategies is fundamental for increasing food security in drought-prone environments. Key points in improving drought preparedness are:

- Strengthening indigenous coping strategies—and possibly providing new options for risk management (both women's and men's strategies should be strengthened)
- Supporting the development and adoption of resource management practices that will protect and improve the productivity of dryland resources, thus increasing the resilience of the natural resource base
- Reducing fluctuation in prices of livestock and grains during drought through expanding market size and reducing transaction costs, and maintaining emergency grain stores—managed by government agencies or by communities
- Developing a set of early warning indicators and a system for monitoring these
- Making early warning indicators and meteorological information available to herders and farmers to use in their individual management decisions, to improve their drought preparedness
- Setting aside drought grazing reserves or strategic water reserves and emergency cereal reserves.

Utilizing Indigenous Knowledge

There are obviously limits as to how much of a project budget can be used for preproject studies and research, but the large scientific uncertainty and disagreements

that surround drylands ecology and management indicate that these issues need considerable attention in project design. Involving local populations at an early stage can be of great help in understanding the systems. These people do, after all, have a tremendous store of knowledge on the systems—as proved by their ability to survive in these harsh environments. They are the ultimate beneficiaries of project interventions, and thus they know best what actual needs are and project objectives need to be.

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CHAPTER 1

Introduction

Dryland areas cover about 40 percent of the world's surface. They are inhabited by about 1 billion people. More than 100 countries, many of them among the least developed, lie entirely or partly within drylands. These areas provide crop and rangeland resources, forest products, water, energy, and minerals. They encompass key watersheds and wetlands and are important stores of biological diversity. They have substantial production potentials, yet the development of these potentials has often proved difficult. Among the constraints to development is low and highly variable rainfall, and the great production risks this creates in agriculture and animal husbandry. During the 1970s and 1980s, conditions in many dryland regions were exacerbated by several consecutive years of below-average rainfall.

The geographical isolation of many dryland areas from major population centers and markets has often blocked the access of those who live there to services, technology, and markets, and thus undermined potentials for agricultural intensification and development. Transport costs for inputs and outputs are high, and profitability highly variable. Provision of social and physical infrastructure is

costly, and communication systems weakly developed. This compounds problems of political and economic marginality. These features of drylands need to be seen as a primary determinant of the policies and management strategies to be adopted for these areas.

Widespread international concern that increasing intensity of human use of dryland resources was causing land degradation, human suffering, and the spread of desert-like conditions to ever wider areas was instrumental in prompting the negotiation of the United Nations Convention to Combat Desertification (CCD). The convention entered into force in December 1996. Participating countries have agreed to work together toward combating desertification and mitigating the effects of drought in countries experiencing serious problems.

This study analyzes and synthesizes the experience of the World Bank and other agencies in drylands management. Recommendations are provided on good policies and practices that can support actions to fulfill obligations arising from the CCD for member countries and for international organizations, such as the World Bank. The paper focuses primarily on "good practice" related to the management of rangelands, dryland farming, and related water resources. Although a major potential for improving the productivity of drylands probably lies in the further expansion and improvement of irrigation methods, this has not been addressed at much length in the paper, primarily because developing this potential faces major obstacles. These obstacles include high investment costs, lack of managerial capacity, and poorly developed markets and supporting infrastructure, especially in the poorest countries. But they also involve lack of water, problems of waterlogging and salinization, lowering of groundwater tables, and the spread of water-borne diseases.

The paper focuses on Africa, particularly Sahelian Africa. This is primarily because the CCD has an African focus, partly because the Sahel is the drylands region most severely hit by drought over the last three decades (Hume 1998). Experiences from the region are, however, compared with those from other parts of the world, with the aim of finding possibilities for mutual learning.

The study addresses the following aspects of drylands management:

- Description of the use of natural resources in drylands worldwide, with a focus on how and to what degree this resource use may result in land degradation, and how dryland resource use may be changed to become more sustainable. Drought preparedness, integrated plant nutrient management, land husbandry, and rangeland management practices will be discussed within this context and related to eco-

nomic, political, and institutional factors.

- Presentation of experiences of different approaches to make drylands resource management more sustainable, with a discussion of their respective strengths and weaknesses and potential for improvements. The discussion will focus on the formation of community-based resource management regimes within different ecological settings.
- Description and assessment of the essential political, institutional, legal, administrative, and managerial actions to be undertaken by governments to support community-based resources management.
- Identification and assessment of the role of the World Bank in drylands management. How can the Bank do more to combat desertification in affected countries, in view of its obligations under the CCD?
- Identification of major gaps in research, particularly in community-based natural resource management, and suggestions to address such gaps.

1.1 Some Definitions

The concepts of "desertification" and "degradation" are marked by confusion and conflicting interests. The confusion is primarily caused by the lack of good and reliable data. In addition, there are several actors in the debate with different values and contrasting perspectives on what a landscape should look like and what people ought to do within their local environment.

"Desertification" and "degradation" are concepts in the same category as "sustainable development" and "community participation"—concepts on a high level of abstraction that aim to describe complex processes. They therefore often tend to be more confusing than clarifying and need to be described in operational terms in order to increase understanding. Often, however, these words are not used for clarification or improved understanding. They are used by actors for certain purposes and to achieve certain objectives linked to the struggle for land and resources. Hence, there is a close relationship between the use of these concepts by various actors—be it national governments, donors, or conservationists—and these actors' approach to land rights and control over land.

Desertification is defined by the CCD as "land degradation in arid, semi-arid and dry sub-humid areas resulting from climatic variations and human activities." It is understood as the result of a subtle and complex interaction of social and environmental processes.

Drylands encompass arid, semi-arid, and dry sub-humid areas, which are areas other than polar and sub-polar regions in which the ratio of annual precipitation

to potential evapo-transpiration falls within the range from 0.05 to 0.65. Hence, drylands include areas with average rainfall between 0 millimeters (mm) and 1,500 mm, depending on altitude and latitude. Defining drylands in terms of average rainfall implies that drylands also encompass areas with good water supplies from groundwater or rivers.

Land degradation is defined by the convention as:

> *. . . reduction or loss, in arid, semi-arid and dry sub-humid areas, of the biological or economic productivity and complexity of rainfed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from land uses or from a process or combination of processes, including processes arising from human activities and habitation patterns such as: soil erosion caused by wind and/or water; deterioration of the physical, chemical and biological or economic properties of soil; and long-term loss of natural vegetation.*

This definition allows different interpretations of "biological and economic productivity and complexity," but it does imply that not all land use changes and landscape transformations should be termed degradation. Some changes are perceived by local resource users as improvement in productivity, while others may see the same changes as degradation. Degradation must be specified and operationalized according to specific human interests and a particular type of use. This means that an area can be degraded or lose value in relation to that use.

Two important aspects of "degradation" are irreversibility and resilience, in that degradation refers to a situation where the productivity loss is effectively irreversible and/or reduces the resilience of the resource use system.

Irreversibility refers to the fact that degradation is an effectively permanent decline in the rate at which the land yields livestock products under a given system of management. "Effectively" means that the natural processes will not rehabilitate the land within a time scale relevant to humans. This definition of degradation excludes reversible vegetation changes. It includes effectively irreversible changes in both soils and vegetation.

It has been argued that degradation should be used only to describe irreversible changes in soil fertility (Scoones 1995). An alternative definition is presented by Tiffen and others (1994): "Degradation is the degeneration of the natural resource base to a point where the costs of restoring it to a level where it can support people at a reasonable standard of living become prohibitively high."

Resilience refers to the capacity of an ecosystem or agro-ecosystem to recover its productivity and complexity after having been subjected to some "shock" or perturbation (such as a drought).

A *drought* is a period of one or two years with rainfall well below average recorded levels.

Desiccation is a process of aridification resulting from a dry period lasting on the order of decades (Warren and Agnew 1992).

Drylands management is here defined as means and ways to command dryland resources, reduce land degradation, mitigate the effects of drought, and improve livelihoods in dryland communities.

1.2 Land Degradation in the Drylands

1.2.1 Contrasting perceptions

Following the United Nations Conference on Desertification in 1977, a number of studies purported to show that deserts were expanding. Changes in vegetation communities and plant cover were most widely used as indicators, possibly because they are most easily observed (Thomas 1993). A popular image was created of the Sahara desert moving southward, while patches of desert elsewhere were expanding, eventually to combine. The expansion was primarily attributed to overuse by humans: rapid population increase was creating pressures to increase livestock numbers, cropping intensity, fuelwood harvesting, and use of irrigation water beyond ecological carrying capacities. The problem was largely understood in Malthusian terms—as one of overpopulation.

Because various forms of communal land tenure are dominant in large parts of the drylands, the problems of overutilization were also understood in terms of the "tragedy of the commons" model (Hardin 1968). Solutions to the problems were thus seen as state intervention or privatization and enclosures to ensure limitations on livestock numbers, controls on firewood gathering, and the setting aside of areas protected from grazing and other use. This perception of the problem may have been readily adopted by civil servants in charge of natural resources policy because it provided support to their vested interests and legitimized their power over resource use (Leach and Mearns 1996). The recognition of or development of common property regimes were often ruled out as viable solutions to resource management.

Nevertheless, recognizing that ultimately resource use decisions are made by herders and cultivators, many projects tried to work with communities to develop regimes for controlling resource use. These efforts have had mixed success. A major contributing factor to lack of success has been that local resource users have often perceived the problems and issues in different terms than civil servants and international agencies. Policy planners must recognize such potential divergence in perceptions between them-

selves and local resource users, and attempt to build bridges. It may be wise to be open to the possibility that local resource users often know better than outside "experts."

Recent studies in research on rangeland ecology in drylands (Ellis and Swift 1988; Behnke, Scoones, and Kerven 1993; Scoones 1995; Hiernaux 1996; Lane 1998) have contributed to a revised understanding of the dynamics of these systems. These revisions do have major implications for optimal management practices. Moreover, they indicate that pastoral management practices are more optimal, more efficient, and not as environmentally damaging as claimed by earlier studies. The revisions thus contribute to a convergence of the perceptions of researchers and pastoralists.

The process leading to the convention contributed to a changed understanding of the nature and causes of desertification and the knowledge gaps that exist. This change is reflected in the definition of desertification adopted at the convention. Moreover, the emphasis placed by the CCD on the important role of local communities in resource management should give a bigger role also to local perceptions of the problem. Some tension still exsts in the convention between conservation and protection concerns in "the West," however, and dryland communities' concern for utilizing and developing the productivity of resources.

The change in definition of desertification over the last two decades can partly be attributed to a number of studies challenging the widely accepted picture of expanding deserts and of desertification as caused by the increasing demands of a growing population. That picture has been challenged on numerous counts:

- Upon closer inspection, many narratives of deforestation and degradation turn out not to be true. They were based on wrong assumptions about the site-specific ecology and history.
- Changes in rainfall patterns cause temporary expansion and contractions of deserts. Rainfall in drylands is highly variable. Much of the aridification observed, especially in the Sahel, can be attributed to a sequence of years of below-average rainfall. There seem to be cycles of several decades' duration of above- and below-average rainfall. The vegetation in drylands seems to have an impressive resilience to long-term changes in rainfall level, so that when rainfall returns, so does the vegetation.
- In arid and semi-arid areas, where grazing resources are annual plants, the concept of equilibrium carrying capacity makes little sense. The annual plants need a short time to produce seed, and seed survive for many years in the soil, so that there will always be seeds present that will germinate when rain-

fall comes, virtually regardless of stocking levels.

- Dryland societies have considerable potential for sustainable intensification of their production systems.

Each of these issues will be addressed in more detail in this section. Clearly they have major implications for what should be considered good practice in drylands management.

False environmental narratives

Within the field of "environment and development," various standard presentations, histories, or narratives exist. According to Roe (1991, 1995), a narrative is a story with a beginning, a middle, and an end, or when cast in form of an argument, with premises and conclusions. It is less normative than ideology and gives a description not so much about what should happen but about what will happen. Different narratives within this field have proved persistent, even in the face of strong empirical evidence against their story line. The "desertification narrative" (Swift 1996) is one example of such a persistent story.

Some of the research during the last decade has now contributed to questioning the assumptions and beliefs behind the crisis narratives presented about people-environment relations in Africa (see, for example, Ellis and Swift 1988; Bonfiglioli and Watson 1992; Warren and Khogali 1992; Behnke and Scoones 1993; Scoones 1994; Tiffen, Mortimer, and Gichuki 1994; Fairhead and Leach 1996; Leach and Mearns 1996). Hence the idea that land management by rural people, in African drylands as elsewhere, causes environmental destruction through ignorance or population pressure is being questioned.

Superficial interpretations of landscape features will tend to reinforce the models that form the lens through which the landscape is seen. Such interpretations or narratives often do not stand up to closer inspection. One example is work on forests in West Africa (Fairhead and Leach 1996, 1998), which found dominant deforestation estimates to be vastly exaggerated. Many of the vegetation forms that ecologists, foresters, and policymakers have assumed indicated forest loss, such as forest patches in the savanna, are—according to historical evidence and the knowledge of local resource users—the results of landscape enrichment by people. The forest islands around villages in the Kissidougou District were not relics of a forest once covering the savannah. Instead, these forest islands had been created by the villagers. Furthermore, many forests assumed to be "pristine" have been found to be "new forests" that have grown on land once densely settled and farmed.

Other examples of criticism of environmental narratives include the new approach to range science and pastoral development that is discussed later in this

report, and the questioning of the severity of the "fuelwood crisis" in Africa and in African drylands in particular. Generalizations about fuelwood use are built on the assumption that general and widespread deforestation caused by household fuelwood consumption is taking place. Deforestation is here seen to be radiating out from centers of habitation, in ever wider circles. The "fuelwood crisis," seen as one of Africa's main environmental problems, is interpreted as a problem of a growing gap between population-driven demand and diminishing resources. This view has been presented in a large number of influential publications (for example, Bailly and others 1982, Eckholm and others 1984, Timberlake 1985, Gorse and Steeds 1987, Harrison 1987). However, data to support this view are few. Recent empirical studies carried out in Africa, on the contrary, question this orthodoxy (Cline-Cole, Main, and Nichol 1990; Benjaminsen 1993, 1997; Tiffen, Mortimer, and Gichuki 1994; Mearns 1995; Fairhead and Leach 1996). (See Box 1.1.)

Change in rainfall patterns

Several researchers claim that the Sahel has undergone a gradual aridification over the last 4,000 years (Kadomura 1994), although with wetter periods in between. It was particularly dry from about 1600 until the 1860s. In this period, the desert front or vegetation front moved about 200–300 kilometers to the south (Webb 1995). Wetter climate returned again between the 1860s and the 1890s, pushing the front north again. New serious drought periods occurred around the turn of the century, culminating with a drought in 1913 (with rainfall only 50–70 percent of the mean). Although with intermittent periods of drought, the 1920s through the 1960s were relatively wetter years. Except for a few years, such as 1994, the last three decades have been a very dry period.

There has been larger deviation from normal rainfall in the Sahel than in other drylands regions of the world (Hume 1998). Large-scale Sahara-Sahelian vegetation changes have been documented using remote sensing technology. Using satellite imagery and ground precipitation records, Tucker and Nicholson (1998) have measured the vegetation boundary at the southern fringe of the Sahara. They observed that the inter-annual variation of this boundary is substantial, varying between years of higher annual rainfall, such as 1980 and 1994, and years of very deficient annual rainfall, such as 1984. Even after 16 years of measurement, they were unable to draw any conclusion regarding systematic trends toward drier conditions for the 1980–96 period. Substantial rainfall and vegetation recovery from the 1984 drought has been found. The results cast doubt on the more extreme assumptions of desert expansion in the Sahelian region.

Box 1.1 Fuelwood use in Mali

Fuelwood (firewood and charcoal) constitutes close to 90 percent of total national energy use in Mali. The dependence on fuelwood is highest among the poor and in the household sector. Even though the expansion of agriculture is generally considered to be the main cause of deforestation in Mali, the extensive use of wood for fuel is also said to cause serious deforestation. Fuelwood use is believed to have the most serious environmental impact in the northern Sahel and in the areas with the highest population densities. Benjaminsen (1993, 1997) carried out two case studies to test these ideas: one in the Gourma area in the northern Sahel and one in the central cotton zone around Koutiala town in southern Mali. Both areas have frequently been presented as extreme cases of fuelwood-induced deforestation in the country.

In the Gourma, however, no relationship between deforestation and local use of fuelwood in the area could be found. The fuelwood used was generally dry wood collected from dead trees. The observed deforestation was caused by drought. The fuelwood crisis in the Gourma is related to economic rather than physical scarcity. Collection distances are increasing, as is money spent on fuelwood, but for the region as a whole there is no physical scarcity of fuelwood.

The central cotton zone is known to be one of the areas in the country with the highest population densities and most intensive land use. The case study in this area took a conventional supply-and-demand approach, comparing available figures on wood production in West African bush and forest formations with data on fuelwood consumption. An in-depth study in one village was undertaken. In addition, the study used available local data on 49 villages provided by the Projet Gestion de Terroir of the Compagnie Malienne pour le Développement des Textiles. The study indicates that locally induced deforestation caused by fuelwood use does not represent an immediate problem in the area. Local use of fuelwood is presently not exceeding forest regeneration. Where there is external pressure on the forest represented by commercial exploitation of wood for sale in the urban centers, however, fuelwood depletion might occur.

Rangeland ecology

Advances in rangeland ecology suggest that there is less reason to fear rangeland degradation than earlier assumed. This view is the result of an important debate concerning the rangeland ecology of Sahelian Africa, and has a bearing on policy, institutional, and legal dimensions of drylands management (Behnke, Scoones, and Kerven 1993; Scoones 1995; Hiernaux 1996).

Hiernaux (1996:16) notes: "The strong seasonality which characterizes the Sahelian environment reduces the risk of overgrazing and damaging the environment to short periods in time and consequently confined areas. These cases aside, Sahelian vegetation appears very resilient to natural and pastoral stresses because of the strong dynamisms of its seed production, dispersion and germination cycle."

He summarizes recent findings on the effect of grazing on Sahelian rangelands, based on monitoring of vegetation changes under pastoral use in the Gourma of northern Mali over 10 years. Hiernaux claims that grazing and browsing affect the Sahelian rangeland production through a web of interacting processes that in turn interact with human activities concerning range protection and management (arable encroachment, harvesting of wild seeds and wild land resources, collection of wood or fuel). Effects are a function of the intensity and the seasonality of the grazing activities. He argues that grazing, particularly in the growing season, may have either negative or positive effects on plant production.

Hiernaux warns, however, that large changes in pastoral systems—for example, through policies that restrict mobility of livestock or enhance more permanent presence of higher livestock populations throughout the year with feed inputs, and thereby reduce seasonal dependence—may have adverse effects on grazing systems. Under drier conditions in areas with less than 300–400 mm rainfall per year, rainfall is the overriding factor determining pasture productivity. Overgrazing is seldom a factor to consider, except in very specific locations. In areas of higher rainfall, 500–600 mm rainfall per year and more, the impact of livestock grazing on range productivity might be more significant, and active rangeland management becomes more of a concern (Behnke, Scoones, and Kerven 1993; Scoones 1995).

Agricultural intensification

Another example of environmental narratives being questioned is the Machakos case study from Kenya (Tiffen, Mortimore, and Gichuki 1994). A team of British and Kenyan researchers studied the interactions between people and the environment in the Machakos District from 1930 to 1990. In the 1930s, with 240,000 people, the district was considered an environmental disaster area. This image had lingered on since, but was questioned by the research carried out in 1990. The environment in 1990 was found to be in a much better condition, even with 1.4 million people—more than five times as many as in 1930. This was due to increased tree planting, terracing, and improved soil and water conservation in general. There are now more animals, agricultural production has increased, and there are more trees and lower rates of erosion. Important to this success has been the access to off-farm income for investment in the land, access to a growing market in nearby Nairobi, and public policies relatively favorable to agriculture and individual land tenure rights. Some of these circumstances, such as the proximity to Nairobi and access to remittances, do, however, imply that the successes of

Machakos may not be replicable everywhere.

The association of agricultural intensification with crop-livestock integration has also been pointed to in other studies (Pingali, Bigot, and Binswanger 1987; Tiffen, Mortimore, and Gichuki 1994; Mortimore 1998). Carrying capacity depends on management, not on soils and climate only. More livestock can be sustained on smaller areas of land provided there is an increase in investment in labor and technologies. In cropping, there is strong complementarity in input use. Raising the use of one input (such as plant nutrients) toward what is optimal for the crops increases the productivity of other factors, such as water and labor.

Associated with intensification are changes in tenure systems. Under most customary and statutory systems in Africa, tenure rights are strongest for land cleared for cropping. Rights to cropland become more permanent and secure as fallow systems shorten. The cultivators then often start to claim exclusive rights to crop residues (which might previously have been free for pastoralists or in exchange for manure or milk). In some areas farmers also set aside areas for pure grazing, invest in hedges or fences, and increase stall feeding. This may represent an enclosing of earlier commons that then effectively become private property. There are losers and winners to these processes, with pastoral groups often being further marginalized.

In dryland areas with long-term settlement but less favorable environments for crop cultivation, there often is a gradual transition from traditional long-fallow systems to shorter-fallow or permanent cropping systems over a few decades, due to population increase (Scherr 1997). Production is low and people are often located far from markets or have little marketed surplus. This reduces opportunities for accumulation and technology investments. Such lands have often been exposed to soil erosion, fertility depletion, and devegetation in large parts of Africa, as well as in Asia and Latin America.

It seems that rising population densities pose a problem for resource management where people do not or are unable to adapt their methods of farming and land use to take into account the reduced availability of land (Toulmin, Scoones, and Bishop 1992). It is likely that "autonomous intensification" may not always keep up with the high population growth rates found in sub-Saharan Africa, given the unfavorable agro-ecological conditions for agriculture and the disabling policy, institutional, and infrastructure circumstances. A relevant question is therefore whether population growth is "ahead" or "behind" the pace of the farmer-based innovation and adaptation.

Questions may also be raised about the long-term sustainability even of successful cases of intensification. Groot,

Breman, and van Keulen (1998) find many examples of falling per capita production and declining soil fertility in Mali and the western Sahel. Up to 40 percent of farmers' income is often accounted for by mining of soil nutrients (which need to be replaced for systems to be sustainable). In areas receiving more than 500 mm rainfall, soil fertility problems are often more limiting to crop growth than water deficiency. Much is unknown, however, about whether soil mining processes and vegetation change simply create temporary changes in productivity or are irreversible or very damaging over long periods.

With such background, it makes sense to accept and even encourage a certain pluralism in views on environment and development directions, while continuing to gain a better understanding of consequences on the natural resource base of different resource use practices. Despite cases of human and environmental disasters and persistent poverty, dryland communities do often come up with very successful economic and social adaptations. The resilience of dryland ecologies, the diversity of livelihood opportunities, and the persistence of local communities are often underestimated. The "tragedy of the commons" metaphor is much too simplistic to account for the wide diversity in development and change of technology and institutions in drylands.

1.3.1 Urban growth

The West African Long Term Perspective Study, which focused on 19 countries over the period 1960 to 2020, provides a less pessimistic overview and scenario than images normally presented of sub-Saharan Africa (World Bank 1996). The study revealed the vitality of societies that in a matter of decades have undergone structural transformation in demography, urbanization, growth in the market economy, and change in social and political systems—a transformation that in most other regions took far longer to achieve.

The transformations are particularly driven by rapid population growth and migration to urban centers, in combination with a rapid and more complete integration into the world economy in terms of trade, migration, culture, and education. In West Africa, 85 percent of the population lived in rural areas in 1960, while an estimated 40 percent will do so in 2020. The study does point to the social and environmental stress involved in the process (Cour and Naudet 1995, Cour 1998). There has been very little increase in food imports to these countries over the last couple of decades, meaning that city-dwellers eat mainly locally produced food.

Urbanization can be seen as a major opportunity for agriculture and livestock production, not only because of its effect on demand and division of labor between rural and urban sectors, but

also because it is mainly city-dwellers who buy land and invest in any major way in urban agriculture. The report holds that peri-urban agriculture is booming, especially fruit, vegetable, and small-scale livestock operations. The study finds a strong correlation between proximity to markets, rural population density, and agricultural productivity. This highlights the essential role of the market in boosting farm output while contributing to agricultural intensification. Access to urban income is also vital for generating capital for investing in agriculture—including investments that might increase the long-term productivity of the land.

1.3.2 Global environmental linkages

Drylands degradation is closely linked with other global environmental issues, notably biodiversity and climate change. Drylands contain a significant endowment of plants and animal species diversity. They are a vital source of genetic materials—some of them potentially important sources of medical, commercial, and industrial products. Land use and land cover conversions often result in loss of biodiversity, loss of habitat, and loss of ecosystem function through sediment pollution of aquatic ecosystems, salt intrusion, and general environmental degradation.

When the organic matter content of the soil is reduced through long-term land use conversions, primarily from grasslands and forests to agriculture, this contributes to increasing carbon dioxide levels in the atmosphere. Due to land use conversion and land degradation, drylands are presently a source of carbon in the atmosphere. With revegetation, they could instead become a carbon sink (UNEP 1997:143). Changes in land use or land cover are also believed to have long-term effects on local and regional climate through changes in the hydrological cycle and in surface albedo, although recent research suggests that effects have been overstated in earlier studies (Hume 1998). If change in climate results in an increased frequency of drought conditions, desertification processes may accelerate. The existence of positive or negative feedback of these various global processes is still a matter of debate.

CHAPTER 2

Global Challenges of Drylands Management

Despite some positive achievements and success stories, the challenges of drylands management remain many and complex. Political and economic marginalization, sometimes compounded by social unrest and civil war, has affected many regions, notably Sahelian Africa. But there also are positive transformations and achievements. Central Asia has undergone important political transitions and changes in property rights systems. South Asia has experienced rapid development of irrigated agriculture, technological change, and market integration. Infrastructure, education, and health services have improved in many areas. Political reforms involving decentralization and democratization and new roles and functions for local communities is a worldwide trend.

Drylands resource use depends first and foremost on millions of community-based actors. It is at the local level that resource use decisions are made. It is at this level that awareness, incentives, and institutional and infrastructure conditions must be appropriate in order to secure sustainable resource management. However, national and international policies are decisive in shaping the incentives and institutional and infrastructure conditions. Thus

improved drylands management primarily depends on changes at this level—in national and international policies. It is at this level that the scope for change is the greatest. Drylands management is a process that requires:

- Concern about the welfare of dryland populations, about resource degradation, and about drought-related problems
- The political will to address these problems
- Implementation and enforcement of appropriate policies and institutional and legislative frameworks
- Active participation in meeting drylands management objectives, from local to international levels.

Hence, drylands management includes the following dimensions:

- *Policy* (objectives, values, will)
- *Institutions and law* (rules, regulations, enforcement)
- *Administration* (executive organizational framework from global to local level)
- *Actors and communities* (a diversity of individuals and groups at all levels of social organization)
- *Resources*, *technology,* and *infrastructure* (both social and physical).

2.1 Concern, Political Will, and Capacity

National policies cannot be effective in countering land degradation unless there is a genuine concern among policymakers for the plight of the people being affected. It is not always obvious that such a concern exists. In many countries political power is vested with the urban population, who may see their short-term interests as conflicting with those of the rural population. Old ethnic rivalries and antagonisms may also prevent those in power from feeling concern. Pastoralists have sometimes been viewed by the ruling elites as a nuisance and embarrassment—even as a threat to national unity. Their production methods and perceived cultural traditions have been seen as opposed to "development." Frequent wanderings across national boundaries have been seen as a threat to national security. There has often been little appreciation of how well suited pastoral production systems are for secure efficient resource utilization and livelihood security under arid and semi-arid conditions.

When governments show little concern for people living in the drylands, pleas for them to become concerned will achieve little. Democratic reforms that increase the political power of drylands people may achieve more. Processes that can convince ruling elites that even their short-term interests are hurt by resource degradation—and that they will be served by taking action to prevent it—may also create concern where previously there was none.

Effective actions frequently imply that there will be losers. A typical case involves devolution and decentralization of decision power as appropriate actions to improve natural resource management. Such suggestions are very likely to be resisted by civil servants and agencies whose power is reduced. Concern therefore has to be great enough to create the political will to undertake actions that might meet resistance from powerful interest groups or parts of the government apparatus.

Toulmin, Scoones, and Bishop (1992:251) put this starkly in the context of devolution of tenure rights to rural communities:

> *A cynical view of the current situation regarding land rights and their lack of clarity sees this as a conscious strategy on the part of governments to justify continued central control, on the grounds that local populations are evidently incapable of managing their own resources. Local administrators help create chaos by arbitrary decisions regarding who has access to certain resources and thus ensure that contesting parties will try to get a decision in their favor by providing large bribes. Clear land legislation and the vesting of authority at local level would damage the interests of these administrators by removing the power to allocate as they see fit. In the case of pastoral tenure, any devolution of power over water and grazing to these politically marginal groups is seen as very unlikely as this would strengthen their autonomy, itself perceived as a threat to central government power.*

Concern and political will are not sufficient, however. Countries also need the capacity to design and implement appropriate policies and actions. Lack of capacity is frequently the main constraint to more effective action. Poor countries often find themselves losing what limited capacity they have due to an inability to pay competitive wages for public employees or to maintain quality in the educational system. But more can be done to use the resources that do exist in affected countries—for example, through participatory processes drawing on the considerable ecology and management expertise that the affected populations themselves possess. Other strategies are to involve the private sector to a larger degree and to introduce civil service reforms that can more effectively tap the competence and capacities of civil servants. Even if domestic capacity is optimally used, industrial countries and international organizations need to contribute to expanding the capacity and resources available for meeting the challenge of drylands management and improved livelihood security.

2.2 Policy, Institutions, and Macroeconomic Considerations

Macroeconomic conditions and general economic policy play important roles in shaping the possibilities for resource management in drylands. Unsustainable external and internal deficits and poor economic growth performance have forced a majority of dryland countries to undertake major economic adjustments in their economies, usually known as Structural Adjustment Programs. These generally encompass a long list of economic reforms, including devaluation, liberalization of domestic markets and foreign trade, liberalization of the financial sector, reduced public spending and budget deficits, tax reform, civil sector reform, privatization of parastatal enterprises, and abolishment of various monopolies. The comprehensiveness, scale, speed, and phasing of adjustment differs among countries, but in most cases adjustments have been major.

Economic crisis, followed by radical reform, has placed great demands on the public sector in charge of designing and implementing the reforms. The fact that one of the prime aims of the reforms has been to cut back on public salary expenditures, especially through reducing the number of public employees, has obviously exacerbated the strain. Under such conditions, improving capacity and competence in the sector is extremely demanding.

The Operations Evaluation Department of the World Bank has found a close correlation between macroeconomic performance and the success of the Bank's projects portfolio in a country—although not necessarily with individual project performance. In most cases the principal linkage between country economic performance and management and project performance is the availability and timing of counterpart funds. During macroeconomic crises, countries may be unable to contribute the agreed counterpart funds, thus slowing the implementation of projects and associated loan disbursements (Redwood III, Robelus, and Vetleseter 1998).

The economic reforms have implications for drylands resource management, although it is not obvious whether the sum of the effects is in general positive or negative. An intended effect of the reforms is to change the domestic terms of trade in favor of tradable goods. As agriculture and animal husbandry are tradable sectors, this should improve relative incomes of these sectors. Declining world market prices have, however, frequently prevented rural producers from noticing much improvement. So, too, have cases where parastatal marketing monopolies have been allowed to pocket the devaluation windfalls as increased marketing margins. This situation highlights the importance of proper sequencing of reforms.

Pastoral development and projects are influenced by macroeconomic policies, such as exchange rates, trade policies, and subsidies (such as those for feed supplements, veterinary services, or water development). The devaluation of the CFA franc in Francophone West African countries in 1994 immediately made exports to coastal markets profitable (at the expense of European Union meat exports), and increased the local livestock prices in Sahelian countries significantly. (But the price of imported veterinary inputs increased.) Subsidies for feed supplements in North Africa and Middle East have benefited many pastoral groups, but also led to heavy investment in livestock and, in turn, to much higher pressure on rangeland.

The removal of fertilizer subsidies as part of adjustment programs has been much lamented on environmental grounds (see, for example, Speirs and Marcussen 1998). In areas where soil nutrient mining rates are high, it would seem appropriate to stimulate the use of fertilizer through, perhaps, subsidies. Fertilizer subsidies could contribute to escape from an evil cycle of high fertilizer prices, low demand, and consequently high unit costs in the marketing of the input.

Experiences with fertilizer subsidies are, however, mixed. The subsidies represent considerable budgetary cost—partly financed through taxing agriculture by depressing producer prices. Very often fertilizer demand has exceeded supply, leading to rationing. The supply limitations may have been due to limited budgets for the subsidy. Rationed supplies have tended to be supplied to politically favored and larger farmers, strengthening these at the expense of small-scale farmers—including women in female-headed households. And the presence of the subsidy has in some cases prevented the development of competitive markets for this input, thereby preventing the cost reductions and improved services that could follow from competition.

In the effort to stimulate fertilizer use it is necessary to consider other (more cost-effective) measures than subsidies—especially measures related to real cost reductions in the transport and marketing of the input. Fertilizer subsidies should, however, not be entirely ruled out as a short-term measure, provided ways can be found to ensure that they do not lead to rationing and obstruction of the longer-term goal of cost reductions through competitive markets.

Reform programs have sometimes included measures to increase land tenure security of farmers, as a means to stimulate investments in land and development of rural credit. Recent studies in property rights theory, however, suggest that customary tenure systems in sub-Saharan Africa are dynamic and provide reasonable security (Mighot-Adholla and others 1991, World Bank 1998). Coun-

try-wide land registration and titling projects are advised against because they would in most cases be inefficient and costly (Platteau 1995a). There is little evidence of private titling leading to increased investment in African agriculture. Constraints to adoption of tech- nology and intensification seem to lie primarily at other levels (capital and labor constraints at the household level, for instance, or weak infrastructure and inaccessible markets). There is also renewed interest in common property regimes, both to safeguard poor farmers and pastoral groups and to promote environmental protection and biodiversity conservation. Common property regimes might be more efficient ways of managing common-pool resources than private property regimes, especially in highly dynamic dryland ecosystems (Behnke, Scoones, and Kerven 1993).

2.3 National Action Programs

Although many developing countries may have hoped that the Convention to Combat Desertification would be a new source of financial transfers from rich countries, such transfers have not come forth. Instead, the convention places the primary responsibility for follow-up with the affected countries themselves. An important implementation strategy of the CCD (Article 9) is that affected countries are to:

> *...prepare, make public and implement national action programs, utilizing and building, to the extent possible, on existing successful plans and programs, and sub-regional and regional action programs. Such programs are to be updated through a continuing participatory process on the basis of lessons from field action, as well as the results of research. The preparation of national action programs shall be closely inter-linked with other efforts to formulate national policies for sustainable development.*

Many developing countries have carried out National Environmental Action Plan (NEAP) processes, which address desertification issues where appropriate. A review conducted in 1994 found that of the 34 developing countries that had prepared NEAPs (or similar documents), all had addressed land degradation and desertification issues. When identifying remedies to deal with environmental problems, the NEAPs emphasized:

- The development of environmental information
- Enhancement of public awareness through formal and informal education
- Development of environmental capacity in order to manage environmental problems efficiently
- Strengthening of legal institutions to secure property rights as well as to enforce environment-related laws.

It thus seems that the NEAPs had in fact covered many of the issues that the national action programs (NAPs) called for in the CCD were intended to address. The need for and value of costly new action programs especially aimed at desertification might be questioned, therefore, when environmental action plans already exist with implementation processes that cover desertification issues. Of course, countering that concern, when a good NEAP is already in place, the NAP process would not need to be very extensive and costly.

The regional or subregional action programs proposed by the CCD may be useful for addressing transboundary issues, which are difficult to address in the national context that NEAPs and NAPs are confined to. The experience with NEAPs in West Africa, for example, is that these environmental plans and strategies are usually not fully integrated in the process of national development planning (Speirs and Marcussen 1998:17):

> *Encouraging investment in land and intensifying its use by farmers can be supported by appropriate institutional and economic policies. However, in Burkina Faso, as elsewhere in Africa, the environment has been marginalized to the sidelines of the main thrust of economic development policies as defined in the adjustment program (PAS) and its agricultural appendix (PASA). The PANE (National Environmental Action Plan) has failed to counterbalance this marginalization of environmental issues, and by concentrating on repeating orthodox dogma about environmental destruction in the Sahel some of the main policy choices to promote more sustainable farming systems in the region have simply been ignored.*

The major challenge in "mainstreaming" environmental policy seems to lie in ensuring that plans and programs in the brief of environment or natural resource ministries—such as NEAPs and NAPs—are integrated with the economic plans and policies of the finance ministry as well as with the plans and policies of line ministries, such as agriculture and forestry. This is frequently not the case, and probably requires that the top level of government shows some interest and determination in coordination for making the plans and programs effective. But it also requires that NAPs and NEAPs reflect and are realistic with respect to the economic constraints faced in the various sectors and in the overall economy. Environmental agencies need to show more clearly how environment and development issues are interlinked, and to direct more attention to the search for "win-win" solutions to environment and poverty issues. Donors may assist in this process of understanding linkages between environment and poverty

and identifying "win-win" solution by incorporating these into their policy dialogue with developing countries—for example, in the Country Assistance Strategy process of the World Bank.

CHAPTER 3

Pastoralism and Rangeland Management

Pastoralism as a production and resource management system has shown remarkable resilience in many parts of the world. Pastoral people still herd their animals in the drylands of Africa, the Middle East, Central Asia, Mongolia, the highlands of Tibet and the Andes, Scandinavia, and Siberia. Pastoralist production has increased in China and Mongolia, following decentralization, deregulation, and expansion of market opportunities (Fratkin 1997, Mearns 1995). This has also happened in the western Sahel, following better rains and the 1994 devaluation of the CFA franc. Pastoralists of North Africa and the Middle East have seen their incomes rise due to substantial subsidies of feed supplements (Squires and Sidahmed 1998). Even so, they face severe constraints on livelihood security. Once a dominant system widely practiced in most arid regions of the world, pastoralism has gradually lost significance and today has much less influence on the broader society.

Pastoralism still provides a living and a way of life for more than 25 million people in Africa. These people make a significant contribution to national and regional economies. Pastoralism can be a more efficient and sustainable land use system than com-

mercial ranching in arid and semi-arid regions of Africa (Breman and de Wit 1983; Behnke, Scoones, and Kerven 1993; Scoones 1995; Lane 1998).[1] This is one reason why pastoralism, at least in policy declarations, has received more attention from donors and governments in the 1990s. In practice, however, investment in pastoralism has dropped over the last decades and is by no means proportionate to its economic contributions to local and national economies (OECD/CILLS 1990).

Government and international agencies have often seen pastoralism as environmentally damaging, due to the assumed inability of communal systems to control overstocking, inevitably leading to overgrazing and inefficient livestock management. Pastoralism, based on communal management systems, has been considered a production system that would undermine itself in the long term unless external regulation were imposed. The new understanding of range ecology, or non-equilibrium ecology, has reduced concern with overgrazing. This has several implications for "good practice" in rangeland management systems (Lane 1998; Behnke, Scoones, and Kerven 1993; Behnke 1994):

- A rangeland's carrying capacity has to take into account the management objectives of rangeland users as well as the vegetation characteristics found on the range, implying devolution of management authority to local herders rather than the imposition of centralized control.
- Tenure systems must allow herders to move at short notice so as to capitalize on areas of high productivity and not be encumbered by time-consuming procedures.
- Tenure systems must provide secure access to a range of ecological zones.

In many ways, this implies support for community-based systems and customary tenure regimes; it has been termed opportunistic management. But these theories are also being challenged. Pratt, Le Gall, and de Haan (1997) criticize the new theories on several points:

- There is a danger that this new perspective underestimates the possibility of overgrazing and erosion.
- The polarization between equilibrium and non-equilibrium ecology makes two disparate states out of what is actually a continuum. Often there are "equilibrium" environments within "non-equilibrium" settings, such as certain types of wetlands. Hence, in most practical situations, rangeland management remains a concern, although of lesser concern in certain areas than in others.
- The new ecology disregards succession as a process in non-equilibrium conditions.
- The resilience of African rangelands does not apply to all grassland types,

and especially not to browse. Where browse plants are destroyed from overuse, they may require 10–20 years in the semi-desert to regenerate.

Hence, opportunistic management may not be appropriate to all conditions (see Table 3.1).

The agricultural and pastoral land areas in the drylands of the world are often quite varied in terms of biological productivity and economic value. Within the drylands there often are areas that are small compared with the total area but that are of key significance to the overall productivity of the land use systems. Wetlands, seasonal swamps, and oases are examples of such important areas. Their dynamics and importance vary through seasons and years and for different groups of users. They are often subject to stricter control and tenure rules, and conflict may also arise over their use. A classic conflict in Sahelian African wetlands is that between pastoral use and farm use. But conflicts also arise between various groups of farmers for the same cropland areas. Moreover, wetlands generally have high biodiversity, productivity, and value for environmental protection.

Irrigation schemes mainly get their water from such wetlands. This may reduce the water flow in the wetlands, thus decreasing the availability of dry-season pasture—and threatening the wetlands' biodiversity and productivity. Irrigated land areas have grown rapidly over the last few decades, especially in developing countries, where they now account for close to 20 percent of total cropland (Scherr 1997). Irrigated lands are typically found in more commercial areas, closer to markets, with more developed and diversified institutions in parts of Asia, Latin America, and North Africa.

Table 3.1 Resilience of rangeland to opportunistic management

Attribute of area under management	*Where opportunistic management theories apply*	*Where opportunistic management is risky or inappropriate*
Climatic zone	Arid to semi-arid	Very arid or semi-arid to humid
Landscape	Varied, with key resource sites	Uniform, lacking key resource sites
Erosion hazard	Low	High
Grass cover	Already depleted, low biodiversity	Div. perennials, sensitive to grazing
Browse	Of secondary importance	Outvalues grass
Bush cover	Open stands	Thicket
Management objective	Stay within derived/deformed state	Move close to natural state
Present mobility	Still mobile	Already confined

Source: Pratt, Le Gall, and de Haan 1997:24.

Local communities are diverse and not always able to solve differences in resource use interests while conserving resources. As economic differences have grown, examples of key resources being taken over by wealthier or more powerful groups within pastoral societies have also increased (Lane 1998, Baland and Platteau 1996). Intra-community diversification in land use practices and identification is also observed and can create new tensions, some being basically agricultural while others are basically pastoral in orientation. Such differences can also reflect differences in values and world views. For example, the agro-pastoral Fulani communities of the Inland Delta in Mali have long been exposed to the effects of drought but have not been able to withstand internal (or external) pressures to put wetland (pastures) into use as cropland, despite pastoral groups being the majority in the communities. (See Box 3.1.) The special Dina system of the In-

Box 3.1 Intra-community differences and conflict over wetlands: The Fulani of the Niger Delta

The Fulani of the Inland Niger Delta control the largest remaining wetland pastures of West Africa. The local communities are divided into several social classes with different land use practices, identifications, and status in the land tenure systems. There are clergymen, pure pastoralists, livestock traders, and cultivators. The Fulani clergymen, who in several villages constitute the ruling coalitions, are basically agro-pastoral and cultivators with medium-sized fields and small herds.

The majority of the pure pastoral groups who possess larger herds do not cultivate. Very few pure pastoral groups have made any strategic investments in crop cultivation (such as buying oxen and plough), although almost half do cultivate small fields. If rainfall improves after the long-term drought, they are likely to re-establish larger herds and move away from cultivation again. This is taken as an indication that this group attaches greater symbolic and cultural values to cattle and the "pastoral way of life" than do the clergymen.

The situation is, however, more complex. Among Fulani livestock traders, who are both richest in cattle and cultivate the largest fields, there are many who have invested in (cash) cropping and expanded land. A polarization in resource conflict is therefore occurring between the pure pastoral groups, who constitute the largest social group, and the groups of traders and clergymen who want access to more land and conversion of wetland pastures to rice fields. Since the clergymen and traders are politically stronger, although fewer in number, conversion of wetlands to cropland continues. The traders have also entered into political alliances with groups of cultivators.

Numbers count, but wealth and power decide the outcome of bargaining over access to cropland, resulting in continuous conversion in the wetlands and loss of grazing resources and biodiversity.

Source: Vedeld 1997.

land Niger Delta is reckoned to be among the more sophisticated of the African pastoral tenure regimes in terms of access control and use regulation. These transformation processes can best be understood by studying the social history of the local elites, village politics, and power.

The fact that internal interests are diverse and that wealthier political elites often capture the benefits of social change raises particular problems if policies are geared toward support of traditional structures and leaders. If allocation of land is to be handled by village leaders, who are not necessarily accountable to their people and who operate with little transparency, the process can easily be corrupted, as has been observed among the Fulani (Vedeld 1997). In Tanzania, where village councils represent local pastoral interests, registration of titles to village land can potentially protect pastures from being acquired by outsiders. But local leaders have been observed to violate land allocation procedures and to give land to whomever they please (Lane 1998:24).

Since the first conference to combat drought and desertification, in 1977, experience suggests that a lack of genuine political commitment to address relevant resource management and development concerns is a key constraint. This lack of political will reflects attitudinal problems among political and ruling elites in different countries and is manifested in very low investments in the drylands and among pastoral groups (Lane 1998). "Only in a handful of countries, out of about 40 where extensive pastoralism is practised, does pastoralism command automatic political or economic priority" (Pratt, Le Gall, and de Haan 1997:6). Even where support is provided, a weak economy and political rivalry between elite groups, with ethnic dimensions, undermine results. Where pastoral groups form a minority, they tend to be marginalized and lose historical claim rights (Dilleyta 1989; Pratt, Le Gall, and de Haan 1997; Lane 1998).

Political economic bargaining processes over access to resources in pastoral areas tend to reflect the hegemony of the state and attitudes among ruling class elites in relation to the relatively weaker political position of pastoral groups. Such perspectives can be used to explain the expansion of cultivation, the loss of land to game parks, emigration, the lack of autonomy and control over resources and transhumance systems, and the undermining of historic rights. In both East and West Africa, processes such as these have spurred local pastoral groups to organize themselves around the issues of land, territorial rights, and access to services.

CHAPTER 4

World Bank Response to Pastoral Development Challenges

The World Bank has been the single largest financier of pastoral development programs in Africa. This has been a challenging role to defend, and the Bank has been under continuous and critical observation by both internal and external reviewers. Over the last three decades, the Bank has gone through an important learning process with regard to drylands management. This process has involved at least three phases.

The first, "ranching," phase lasted from 1960 to 1980. This period involved fairly heavy capital investments in fencing, water supply, and parastatal ranching. Typical projects were found in Kenya, Botswana, and Yemen. Gradually the ranching model was abandoned and this type of project got a broader focus, although still concentrating investments in development of livestock and rangelands in terms of water, infrastructure, and markets. Typical examples at that point were found in Eastern Senegal and Somalia Central Rangelands. Both internal and external observers of the first generation of Bank projects argue that the lack of focus on people and institutions was a major reason for failure from a development point of view (Sandford 1983; World Bank 1985; Swift 1989; de Haan 1994; Lane 1998; Pratt, Le Gall, and de Haan 1997).

The second phase, from 1980 to 1995, dealt with pastoral association building and natural resource management (NRM). At this stage, the creation of pastoral associations started to dominate World Bank lending. At the same time, crop-livestock integration concerns became prominent in the early 1980s, following the drought. This reflected both an objective of assisting pastoralists, who were settling in increasing numbers, and a goal of alleviating pressures from what was considered overgrazed land (Vedeld 1994). It was also observed that cultivators increasingly bought livestock from pastoral groups and generally increased investments in oxen, ploughs, and animals (compare Speirs and Olsen 1992).

The pastoral association phase continued the development of pastoral organizations, while increasingly focusing on the overall policy framework for pastoralism. Initially, pastoral associations were built around rangeland management. A case often referred to as a "success story" by World Bank staff was the Eastern Senegal Rangeland Project. But even here, under settled agro-pastoral conditions (Wolof, Mandinge, Fulani) and "equilibrium" conditions (700–1,400 mm per year of rainfall), the efficiency of the grazing scheme declined once the project management paid less attention to the pastoral associations in the second stage of the project (Shanmugaratnam and others 1992).

The pastoral associations were inspired by the customary tenure regimes and authority systems. The basic logic behind ranching to some degree continued to be the control of overstocking and resource utilization within certain broader territorial boundaries by attempting to introduce grazing schemes. In practice, however, the rangeland management aspects were often downplayed in response to the low priority accorded to this by local pastoralists. It is fair to say that such grazing schemes have had limited success. Improved water and veterinary services were in higher demand (Shanmugaratnam and others 1992, World Bank/OED 1998). While pastoral associations rarely achieved meaningful functions in NRM, narrowly defined, they proved more efficient in managing revolving funds for veterinary drugs and managing wells (Shanmugaratnam and others 1992). It was noted that water point management needed systematic emphasis so as to achieve meaningful rangeland management (Shanmugaratnam and others 1992).

Since 1995 the World Bank has focused more on integrated community-based NRM. This phase, which continues to evolve, built on lessons from the pastoral association projects. Examples in Burkina Faso, Mali, and Mauritania show that the new projects are of a national character, oriented more toward settled cultivators, reflect national priorities, and tend to accord much less attention to pastoral zones and communities.

To some degree the shift in focus reflects parallel shifts in the World Bank and in general development trends and thinking—moving from a focus on technological and infrastructure support to one on institutional and policy aspects of development.

Like most donors and governments in the early 1960s, the Bank responded to perceived problems of overgrazing in pastoral communal areas with projects to settle pastoralists and introduce ranching schemes. The overall goal was to control stocking rates according to fixed carrying capacity estimates. Today, ranching is perhaps more an aim of governments than of major donors such as the World Bank and USAID. The adoption of the new directions in African rangeland management started in the mid-1990s (de Haan 1994; Gilles and de Haan 1994; Pratt, Le Gall, and de Haan 1997). These changes in the policy of the World Bank are often not recognized by external reviewers. At the same time, a certain pluralism in views is observed internally in the Bank on how to address rangeland management, in that the holistic management approach is given fairly high prominence and argued to be relevant for drier ecosystems of the Sahel (Pratt, Le Gall, and de Haan 1997). This holistic approach is being tried in a pilot project that places a lot of emphasis on rotational grazing systems and requires fairly high levels of institutional capacity, both at communal and state levels.[2]

While the World Bank in the 1980s funded pastoral development projects in most East and West African countries with major dryland zones, there are currently very few such projects.[3] The lending for pastoral development is stronger in other regions, including Asia (China in the Sinjang Province), Middle East and North Africa (Egypt), Iran, and the Yemen Arab Republic. De Haan (1994) estimated that the World Bank's contribution to pastoral development has been cut by two-thirds from about $150 million per year in the 1980s to an average of about $50 million per year in the mid-1990s. Less than half of this would be for pastoral development in sub-Saharan Africa. The question, then, is whether the Bank—as an implementing partner of the Desertification Convention—is prepared for a re-vitalized pastoral development strategy and what "best practice" recommendations should guide such a strategy.

4.1 Lessons from Building Pastoral Associations

Beginning the 1980s, projects supported by the World Bank strongly emphasized the creation and building of pastoral organizations as a means of establishing relations between pastoralists and support services, especially within animal health, and of improving management of rangeland and water resources. Herder organizations have a central role in pastoral de-

velopment. Still, there are different views on the roles for pastoral associations and the functions they can fulfill, and on how pastoral institution building can be facilitated. Within the Bank there has been an explicit recognition of the site-specificity of pastoral problems in the drylands and the need to adopt a longer-term perspective on pastoral development (Steeds 1989, Gilles and de Haan 1994). This means that there are no universal models of pastoral organizations for the drylands. Different forms are appropriate for different functions (Sandford 1983; Pratt, Le Gall, and de Haan 1997).

4.1.1 Placing local institution building on the political agenda

One positive achievement of pastoral institution building in Mali, Mauritania, Niger, and Senegal was that governments and donors recognized the importance of developing local capacities and involving people in broader aspects of resource management (Shanmugaratnam and others 1992). The governments have also taken some steps toward this end, with the support and encouragement of the World Bank. This means that pastoral institution building has entered the policymaking process and has been placed on the rural development agenda.

On the other hand, the processes of institution building also reflected important shortcomings in policy and institutional arrangements, and in project organization and management. In all four cases studied, there were constraints on the allocation of financial and professional resources and major government and project failures. One of the most evident manifestations of the shortcomings was the top-down character of institution building. This was a result of several unresolved issues concerning lack of commitment to pastoral development, autocratic institutional cultures in state agencies, change in herd ownership (absentee owners), decentralization of project administration, project design and identification of rallying points for the associations, and lack of capacity at the local level and among pastoral leaders (a low literacy level, for example). It was found that the four projects had not done much to create an enabling environment for pastoral associations and had underestimated the probability of drought and the needs for drought emergency measures.

The projects included a few social scientists but there was a general lack of participation by women, both at project and local levels. This might be a problem in that the roles played by women in society and the way the projects affected their lives were not given due attention. The assessment stressed that local institution building is a complex, time-consuming, and difficult process that requires persistent support and commit-

ment by governments as well as encouragement by donors.

4.1.2 Natural resource management: A low priority?

The pastoral associations contributed to growth in environmental awareness, fire control, sand dune stabilization, pasture rehabilitation, and conflict resolution (Shanmugaratnam and others 1992). There were, however, no major achievements except those related to wells management (Niger), access control, and resource conflict resolution (Senegal). "Shadow participation" was a real problem in several of the environmental protection measures, such as management of grazing schemes, enrichment of pastures, sand dune stabilization, and de-stocking/stocking regulation. Activities related to resource enhancement and regulating use often had low priority.

Although some of the pastoral associations showed some limited potential for various natural resource management activities, primary interest lay with food security, resource security, defense of territory, negotiation of access and resolution of conflicts (access control and regulation), water development, provision of animal and human health services, credit, access to markets, and improvements in price of produce. This was not fully realized by the projects, which focused primarily on water and veterinary services and NRM, as well as crop-livestock integration and crop cultivation. Water point management was suggested as a first step in natural resources management and creation of cohesive groups. At the water-point level, decisions could be made to set aside some areas close to the well for late dry-season grazing—that is, for the organization of simple grazing schemes.

4.1.3 Operation of services and viability of pastoral associations

Although the pastoralists did not always cite them as problems, the absence or low level of literacy, management skills, and revenue-generating abilities were major obstacles to capacity building and viable institutions. The most positive achievement among the pastoral associations involved the operation of revolving funds for veterinary drug stores, even if in general the associations were found to have relatively low income-generating capacity and financial viability. They seemed to depend on continued external assistance, which they have not been able to obtain after the project ended. In Mali, most of the pastoral associations have received little or no support and have not acquired any meaningful functions (Vedeld 1994).

It can be argued that today the situation for pastoral institution building is more favorable, although not primarily for more narrow NRM and conservation purposes, as local people believe. Interviews with pastoral leaders and pastoral organi-

zation members in four West African countries confirmed a felt need for these institutions (Vedeld 1992:20). Experiences have shown the pastoralists that they have to come to terms with the state for economic as well as political reasons. They are aware that their resource base is shrinking due to land conversion and degradation, and that range and water scarcities are assuming scales that are, in most situations, beyond their means to manage. They feel the need for more literate leaders who can comprehend the laws and policies affecting their well-being, deal with the bureaucracy, and bargain for rights and institutional reforms.

4.1.4 Shortcomings of pastoral institution building

Many of the shortcomings of pastoral institution building still remain, as shown in the recent evaluation of the Mauritania Second Livestock Project (1986–95) (World Bank/OED 1998). The evaluation illustrates some difficulties of implementing a pastoral development project when an enabling policy and institutional arrangement is not in place. Although the project managed to establish 39 pastoral associations, it failed to reach most of its originally stated objectives in improving rangeland management and services to members. A series of design, institutional, and implementation problems affected the performance of the pastoral associations and project progress:

- National-level project structures did not provide sufficient resources and support for the new institutions.
- Project structures and organizations were not able to turn a top-down initiative into a bottom-up mobilization of pastoralists for capacity strengthening and institutional development.
- The project attempted to expand the number of associations too fast.
- The large size and scale of the pastoral associations made it difficult for them to overcome internal heterogeneity and to act as collective enterprises.
- Confusion emerged about the institutions' role as socio-economic cooperatives (such as handling veterinary drug stores) and their role as territorial associations.
- The project continued to place primary emphasis on range management even though the main concerns of the members were water and animal health.
- The primary concern of the project with "natural resources management" was not well attuned to local demand.

4.2 "Good Practice" in Pastoral Development

Shortcomings of pastoral development projects have shifted attention in the World Bank to inappropriate policy and institutional frameworks at the national level and to major attitudinal and institutional weaknesses within the imple-

menting agencies. Approaches should be flexible and long-term, and built on local knowledge and capacity. Reflecting advances in range ecology and climatic research, drought management has become a specific form of support as an integrated component of programs, although not yet tested in practice. The diversity of local communities in terms of power and gender is recognized, although dealing with equity issues under decentralized regimes raises unresolved problems (de Haan 1994; Pratt, Le Gall, and de Haan 1997; World Bank/OED 1998).

Pastoral institution building is today viewed as a long-term cumulative and participatory process. It is a means for potentially empowering pastoral groups, improving service delivery, developing livestock, and promoting sustainable use of range resources (Scoones 1995; Pratt, Le Gall, and de Haan 1997). Recognizing that major weaknesses prevail in projects, it is necessary to shift from present project approaches to a broader institutional program approach guided by long-term perspectives and more genuine government commitment. In order to turn top-down initiative and approaches into bottom-up mobilization of people, governments need to foster an enabling environment for local capacity building—one that takes into account local variability and site-specific conditions related to the climatic and ecological features, socio-economic conditions, and wider political economic relationships. "Experience suggests that influential, competent and responsive customary leaders, relatively homogenous social groups, in combination with appropriate state services and genuine dialogue, are all critical for the establishment and operation of pastoral associations" (Vedeld 1994:41).

4.2.1 Addressing pastoral association building under "dis-equilibrium ecology"

Under the premise that rangelands are generally robust and resilient, future rangeland management policies should be more concerned about drought preparedness, resolution of resource use conflict, poverty, equity, and economic efficiency than about control of overstocking and desertification. Few Bank-financed projects have discussed the idea of establishing pastoral associations to cope with and resist drought conditions or to handle conflicts (World Bank/OED 1998).

Strict regulatory measures will be unrealistic and in most cases unnecessary in the drier rangelands. Legal and governance structures for these rangelands should be more focused on regulation of access rights to key resources, as suggested by Behnke (1994) rather than on controlling utilization and stocking rates on a wide scale. Under wetter rangelands, the regulation of stocking rates according to available pasture would be more of a concern. One key lesson from the new

body of literature on range ecology and pastoral development is that efficient and sustainable pastoralism ultimately depends on flexible and mobile transhumance systems and on access to key resources, while mobility is presently being undermined. Such tenure systems would require recognition of common property regimes with more autonomy and authority for community-based groups.

4.2.2 No geographical delineation in arid and semi-arid zones

As a solution to the pastoral tenure issue, the delineation of geographical boundaries for each pastoral association has severe weaknesses, especially under highly dynamic ecosystems. Although the socio-geographical boundaries, formalized as tenure contracts, might give some leverage for protection against neighbors "poaching" grass, they provide little protection against crop encroachment (from within or from outside the community), no solution to resource conflicts (in fact, they may be enhanced), and little protection from expropriation by the state (for irrigation schemes or game parks, for instance).

In the evaluation of the forerunner to the Mauritanian national NRM project, which builds on the Gestion de Terroirs approach, pastoral groups were worried that the village territory model might squeeze them out and limit their access rights to key resources. This has also been a concern in livestock projects of Niger, Senegal, and the Central African Republic (World Bank/OED 1998). Interaction between pastoral systems and agricultural systems is not likely to be favored by integration of livestock within agricultural systems and agricultural intensification. While certain groups can benefit from integration, other groups (such as transhumant pastoralists) are likely to be much worse off and to lose options for access to resources and benefits from interaction.

A major problem with these geographical boundaries relates to the failure to distinguish between indivisibility of the ecological resource systems and the divisibility of the benefits. Optimal use requires flexible boundaries to allow for mobility and resource sharing. But there are other ways of dividing the benefits from these resources recognized in a range of customary property rights institutions, related to some individuals owning the land while others have usufruct rights to browse and forest resources, rights of transit, or control of the wells. A program that seeks to address the property rights issue needs to relate to the diversity and complexity of customary institutions and tenure rules.

4.2.3 Policy, tenure, and conflict resolution

Pastoral development depends on enabling policy and institutional frameworks

that recognize the specifics of pastoralism. A generalized rural development policy will not capture the particularities of the pastoral environment, its specific institutions, and the multiple roles that livestock have there. Strong economic and social arguments can be made for investing in pastoralism (Pratt, Le Gall, and de Haan 1997). A main principle for pastoral development should be to minimize dependence on external inputs. Nonetheless, external support is needed, for example in the form of organizing veterinary services.

Implementing policies requires financial backing, commitment, and administrative and legal arrangements. Major emphasis in research and development has been placed on appropriate legal frameworks that would foster relative autonomy for pastoralists for managing their own affairs, including tenure systems. Pratt, Le Gall, and de Haan (1997) point to two key questions concerning the legal codes that need attention in program formulation: the forms of organization that are already recognized in law, and the extent to which these can be meaningfully operated using customary rules and systems; and the possibility of establishing new organizations while providing recognition of customary authority to control and manage resources within the jurisdiction of custom.

Change in legal codes requires first an assessment of what forms of tenure and institutions are appropriate to the local circumstances, and then propositions regarding any changes. It is essential that legal changes are possible and likely to become effective through appropriate administrative arrangements (compare Le Roy 1992; Le Roy, Karsenty, and Bertrand 1996).

To meet such institutional concerns, pastoral land tenure reforms must be perceived as a political process. Instead of drawing geographical boundaries, the state needs to determine a mandate for local authority structures in procedural law rather than registering tenure limits in statutory law. Instead of trying to draw lines through rapid appraisals, the focus should be on fostering institutional arrangements at local and central/court levels and letting these evolve through bargaining processes in political, administrative, and legal arenas. These processes must build on the genuine will to build dialogue, recognition of common interests as well as conflicting interests, and the capacity to reach compromises among various stakeholders.

Intra-community tensions call for institutions that can handle conflict on a continuous basis. Such conflict management requires co-management systems in order to cope with the larger ecosystems as well as to address social-economic and political conflicts at district and regional levels. But as suggested by Swift (1994), under highly dynamic ecosystems it is

important to decentralize power and responsibility to the lowest level consistent with the provision of services and maintenance of accountability.

4.2.4 Political will and commitment

Ambiguity in the practice of laws and regulations is often considered to be more of a constraint to pastoral tenure security than lack of recognition in law (Toulmin 1991). This reflects "attitudinal problems" at the level of national governments but also within donor institutions (Pratt, Le Gall, and de Haan 1997:98). Various ways of addressing "false images" of pastoralism include system studies to inform decisionmakers, pastoral information networks, selective dissemination of information, and short courses for concerned staff. More systematic efforts to address institutional cultures within livestock departments and project administration have also been suggested (Shanmugaratnam and others 1992, Vedeld 1992). It has often been external assistance, not internal pressure, that has determined the extent to which the state has actually intervened and provided assistance to pastoral areas and communities (Pratt, Le Gall, and de Haan 1997; Vedeld 1992).

Government investments in the pastoral and livestock sector been not been well adapted to local needs in either level or form, nor have they matched the proportionate contributions of the livestock sector to the national economy. The level of investment in Mali in this sector, for example, has been as low as 1 percent of annual government budgets, while livestock account for 20 percent of the GDP in an average year and are the second largest export commodity (OECD/CILLS 1990). Provision of social services, infrastructure, and veterinary services have often been neglected, especially in the driest areas.

4.2.5 Administration of pastoralism

Behnke (1994) has put forward six organizational principles for new rangeland administrative structures in non-equilibrium environments:

- The administration of resource use should at least pay for itself. For management to be sustainable, costs must be contained.
- Management systems must cater for the inherent characteristics of range environments.
- Legal rights to control access to and management of resources must be affirmed.
- The management approach should shift from regulation to allocation and upholding rights of access to resources. The role of central authority becomes one of arbitration in cases of conflict rather than direct intervention.
- The use of directives (executive orders) and legislation to dictate the content

of property rights should be avoided. Customary tenure arrangements are too complex to codify. The state should provide a framework within which conflicting claims for rights of access to resources can be assessed and resolved.

- Range management should be focused on "key" or limiting resources—those most crucial to productivity of the wider dryland ecology, or the most frequent subject of conflict.

4.2.1 Technology, infrastructure, and labor constraints

A major issue is whether there is potential for improving the productivity and sustainability of pastoral systems through introduction or development of new technology. Early technical interventions in pastoral systems focused on increasing water supplies, improving veterinary services, formalizing livestock marketing, and encouraging rotational grazing. Many of these inputs were appreciated locally. But even if a technology worked, development objectives often were not achieved because the technology was applied out of context, without sufficient attention to how pastoral systems operate.

An illustrative overview of possible technological interventions and the importance of sequencing of inputs is provided by Pratt, Le Gall, and de Haan (1997:75). They recommend starting with strategic water development, animal health, and marketing; moving into management of key resources and food security (including cropland, water spreading and harvesting, animal husbandry); and then introducing the more complex and broader aspects of grazing management at a later stage—when community-based organizations are well established. Education, functional literacy training, and leadership capacity building are central. Poor rural infrastructure is likely to be a major constraint to pastoral economies and organizations. Infrastructural problems are often not addressed, however, partly due to the high costs involved.

4.2.2 Summary of "good practices"

In summary, certain general recommendations can be set forward as "good practices" for pastoral development and rangeland management. (See Box 4.1.) A main guiding principle for pastoral institution building is that "if users can engage in face-to-face bargaining and have autonomy to change their rules, they may organize and beat the tragedy of the commons" (Ostrom 1998:4). Whether they are able to achieve this depends on the enabling environment. Long distances and poor infrastructure are clearly constraints to more frequent face-to-face communication in the pastoral drylands.

It is important that pastoralists, as local users of resources, participate active-

Box 4.1 "Good practices" for pastoral resources management

Approaches to rangeland and pastoral development should preferably evolve from local priorities, not from preconceived ideas of development planners about requirements for natural resource management and protection.

Project emphasis on resource management requires intensive support for local initiatives and views, as well as recognition of the limited array of range management technologies available for improving productivity.

When strong local structures for development-oriented activities do not exist, a sequenced and process approach to project operations is required, especially when local socio-economic and resource management systems are not well known.

Government agencies must create enabling institutions and show commitment to development of the wider pastoral system, based on recognition that pastoralism is a viable and efficient use of dryland resources.

Knowledge gaps between local perceptions and those within governments, donors, and researchers on ecological dynamics and social issues must be addressed.

Start small and expand through careful phasing of inputs and support for capacity building. The initial focus should be on food security and on literacy and skills for leaders, women, and men in the community (in that order of priority), including civic education and information, advocacy, and skills for non-land-based or urban employment. Move on to broader aspects of natural resources management later.

Foster a diversity of organizations at different levels and for different purposes: customary, mixed, nongovernmental, private entrepreneurs, local government, state agencies.

Authorize local users and leaders to take responsibility.

Identify low-cost and simple ways of increasing drought preparedness and managing drought.

Develop and provide low-cost veterinary services to pastoralists.

Build local capacity and courts for conflict prevention and management through genuine dialogue, lobbying, and consensus building, including actions that foster growth of a broader pattern of local leadership in the communities.

Promote an enabling policy and institutional arrangement that enhances local benefits, including increased investments for infrastructure and social services, civic education, and health and water development in the livestock and pastoral sectors.

ly in all aspects of development and that they—independent of external agents—seek to create associations to share information and to coordinate action. They must themselves search for benefits of working together, including ways of lobbying for increased support. They must find ways of reducing costs. They must

draw on their cultural endowments and knowledge of local resources to find innovative institutions to match local conditions (Ostrom 1998:5).

CHAPTER 5

Dryland Farming and Technological Change

Dryland farming is a challenging and risky operation. The difficulties of developing sustainable farming generally grow with increasing aridity (low rainfall and high temperatures) (Stewart and others 1990). One reason is that response to inputs, such as labor or fertilizer, is lower in an arid environment. Even though the relative increase can be the same as in sub-humid areas, the absolute increase will be less. Variable and erratic rainfall also creates extreme variations in yield, making investments in costly seed and fertilizer inputs risky. And it is more difficult to accumulate soil organic matter under arid conditions, due to low biomass production and high decomposition rates for soil organic matter. Soil erosion and run-off will generally be high under semi-arid conditions because of sparse soil cover. In addition to constraints related to ecological factors, socio-economic factors such as poorly developed infrastructure, small markets, and high transport costs of inputs and output make investments in new technology less profitable.

In order to reverse the declining agricultural production per capita in sub-Saharan Africa, agricultural growth rates need to exceed current high population growth rates (Badiane and Delgado 1995, Cleaver 1997). This, too, is a challenging task.

There is, however, a large potential for faster agricultural growth. Current use of yield-enhancing technologies is very low in the region. Fertilizer use is extremely low, and irrigated areas cover just 20 percent of their potential. There is thus a considerable scope for yield increase. Dryland areas are often considered to have low potential for agriculture, but research clearly shows that in drylands with more than 500 mm of annual rainfall, doubling and tripling of agricultural yields is within reach (Penning de Vries and Djitèye 1982). Under these conditions, plant nutrient supply—not water availability—is often the most limiting factor for crop growth. Soil nutrient depletion is widespread. It has been calculated that average nutrient loss for 37 countries in Africa during the last 30 years was 660 kilograms of nitrogen per hectare, 75 kilograms of phosphorus (P) per hectare and 450 kilograms of potassium per hectare (Stoorvogel and Smaling 1990). Various studies led Sanchez and others (1997) to conclude that soil fertility depletion in smallholders' fields is the fundamental bio-physical cause of declining per capita food production in Africa.

Introduction of new farming practices to Africa has in general not been successful, and most of the growth in production in sub-Saharan Africa has been due to the expansion of cultivated area. Major reasons for the failure of past efforts to introduce yield-enhancing technologies include inappropriate agricultural and economic policies, discrimination and heavy taxation of the sector, low population densities and poorly developed rural infrastructure, high transport and transaction costs for inputs and products, low investment in agricultural research, and low general education levels. Difficulties arising from economic crises and adjustment, falling world market prices for agricultural commodities, long-term drought in parts of the region, and wars might also be added to this list. However, introducing yield-enhancing technologies will be easier where land is scarce. Where it is still abundant, farmers have little demand for yield-raising technologies, since extension of the cultivated area requires less capital than intensification—and is sometimes also less labor-intensive.

Unless agricultural practices are changed, it is unlikely that annual growth rates of 4 percent can be achieved. Changing agricultural practices will require both enabling policies and technologies that are adapted to the small-scale farmer. Modifying existing practices is usually more acceptable to farmers than radical change. New technologies should be presented to farmers as a basket of options rather than as ready-made solutions (Chambers 1997, Pretty 1995). A long-term commitment, flexibility in approach, and mutual learning are key issues in relation to the development of appropriate technology.

As labor supply is often a primary constraint, especially during land clearing, planting, weeding, and harvest seasons, new technology must enhance labor productivity if it is to be attractive to farmers. The risk aspect of new technology as well as the effect on gender relations should always be considered.

Technologies that require cash outlays and labor input will often be more beneficial to the wealthier groups in society. The more demanding a technology is in terms of capital, land, and labor, the less likely it is that the poorest segments, including female-headed households, will be able to benefit from its introduction. For these groups, it is of special importance that the technology is low cost and minimizes risk. The possible effects of new technologies on gender relations need, however, to be based on closer investigation, not just on assumptions. (See Box 5.1.)

Box 5.1 Gender and new technology

A recent case study of introduction of new technologies in Mali (Lilja and others 1996:1345) concluded that:

The women-in-development literature often asserts that new agricultural technologies have a negative impact on women's welfare because men capture most of the benefits. Our results, on the contrary, indicate that the new agricultural technologies on communal fields increase women's income by increasing the daily wage in communal production. Moreover, technological change generates new income streams that reduce the female-male wage differential....In this environment, targeted policy on gender-specific production may be less productive than interventions designed to increase the productivity of all family members. However, a more general claim merits further empirical study.

5.1 Integrated Nutrient Management

Integrated nutrient management (INM) is an approach to soil fertility management that combines organic and mineral methods of soil fertilization with physical and biological measures for soil and water conservation (Donovan and Casey 1998).

INM adopts a holistic view of plant nutrient management by considering the totality of the farm resources that can be used as plant nutrients. It is based on three fundamental principles:

- Maximize the use of organic material.
- Ensure access to inorganic fertilizer and improve the efficiency of its use.
- Minimize losses of plant nutrients.

The choice of INM technology depends on market situation, the price ratio of inputs and output, availability of inputs, alternative use of organic material, labor cost, farmers' knowledge base, and so on. Local adaptation is always necessary. This section looks at these factors in relation to the three principles.

5.1.1 Principle 1—Maximize the use of organic material

Rainfed farming systems in regions of low or erratic rainfall are nearly always low-input because of the high risk of failure (Hudson 1992). They are highly dependent on release of plant nutrients from soil organic matter and from organic manure. Soil organic matter plays a critical role in maintaining the fertility of the soil by increasing water-holding capacity, reducing surface crusting, increasing cation exchange capacity, and acting as a buffer against pH changes in the soil (Pieri 1989, Breman 1998, Powell and Unger 1997). However, organic materials necessary for maintaining soil organic matter are not available in ample supply in drylands, and are often used for competing purposes, such as building material, animal feed, or fuel. Organic inputs can be attractive sources of nutrients in the sense that they are usually produced locally, and may therefore be less costly to apply than manufactured fertilizer.

But there are also limits to the use of organic fertilizers, such as:

- Too little is available to meet the requirements of a moderate yield
- Only a limited amount of phosphorus is supplied
- There are high labor requirements in the application of manure compared with fertilizer, because fertilizers have an nitrogen content of 20–48 percent while organic manure has 1–4 percent
- Release of nutrients from organic sources is often not well synchronized with plant demand for nutrients (Sanchez and others 1997).

The organic sources of nutrients are crop residues, fixed nitrogen, farmyard manure, household waste, and mulches. The choice of soil fertility management technology will depend on factors such as availability of land, agro-climatic conditions, crop preferences, and markets.

Rotating grain legumes with cereals is a widely used practice to supply nitrogen, but the amount of nutrients available this way is limited. Most of the nitrogen fixed is concentrated in the pods, which are removed with the harvested product (Sanchez and others 1997). Nitrogen fixation in drylands is also reduced by low availability of phosphorus and a short growing season (Breman 1998). Despite these limitations, it has been shown that cowpea can give a residual effect equivalent to 40 kilograms of fertilizer nitrogen per hectare in a cowpea and pearl millet rotation (Bagayoko, Mason, and Traoré 1998).

As livestock densities are often high in drylands, presumably animal manure is available in sufficient quantities to meet plant nutrient demand. But the quality of manure is highly variable, depending on the quality of the feed and the way the manure is collected, stored, and applied. Research conducted in Niger shows that manure production from the national live-

stock herd can only supply about 25 percent of the nutrients needed to replace those lost in a modest pearl millet harvest of 0.4 ton per hectare taken as a national level (Williams, Powell, and Fernández-Rivera 1995). Sandford (1989) has estimated that 16–47 hectares of grazing land per hectare of cropped land were required to produce sufficient amounts of manure for sustaining a maize yield of 1–3 tons per hectare in a semi-arid environment in West Africa. These findings show that manure can at best be considered a supplement to other sources of nutrients.

Crop residues can play an important role in maintaining soil fertility. Long-term research from the Sahel has shown that use of mineral fertilizer alone, without returning crop residues, is not sustainable, as it results only in a temporary increase in yield (Bationo and others 1995). Surface-applied residues reduce soil temperatures—which can reach detrimental levels under dryland conditions—and contribute to reducing the problems of soil surface crusting. In areas where there are problems of wind erosion, surface residues will also trap wind-borne materials that are rich in nutrients. In areas where there is a serious scarcity of fuelwood, manure is also used as fuel. Developing alternative fuel sources could increase the role of manure as a source of plant nutrients in these countries.

5.1.2 Principle 2—Ensure access to inorganic fertilizer and improve the efficiency of its use

It is unlikely that yield will increase much in drylands unless fertilizer use is increased (Sanders and Vitale 1998). (See Box 5.2.) Experience shows that where yields have increased, it has been where fertilizer is used in combination with improved crop varieties (Cleaver 1997). Factors affecting fertilizer use are availability, access to capital, yield response, relative prices of fertilizer and produce, and yield and price risk. Availability is often limited by poorly developed local infrastructure, thin markets, and a lack of competent dealers of fertilizers.

Inorganic fertilizers have an immediate effect, and the release of nutrients is often well synchronized with plant growth. Uptake of nutrients from fertilizers is more efficient than from organic sources. Recovery of nitrogen from leguminous plants incorporated into the soil is 10–30 percent, while the recovery of fertilizer nitrogen is 20–50 percent (Sanchez and others 1997). Fertilizers will also increase soil organic matter through increasing the total biomass production in roots and above-ground parts (Pieri 1989). Roots and crop residues left as mulch will contribute to improving the soil organic matter balance. Increased fertilizer use can also improve the water use efficiency in crop production. In the Sahel, 10–15 percent of rain water is utilized

Box 5.2 Investing phosphorus in dryland agriculture

Phosphorus, together with nitrogen, is the nutrient most frequently limiting plant growth in sub-Sahara Africa. Phosphorus often becomes a limiting factor because 60 percent of this nutrient is removed with the harvested product if the stover is retained in the field (Sanchez and others 1997). It is therefore impossible to rely only on recycling plant residues for the supply of phosphorus.

Inorganic phosphorus can be supplied as phosphate rock (PR) or different forms of water-soluble phosphorus (single super phosphate and others). PR is cheaper to apply than solubilized phosphorus, but many PRs have a low capacity to release phosphorus for plant growth. However, some of the PR can also be used in direct application. In Africa, PR of medium quality and above is found in Senegal, Niger, Mali, Burkina Faso, Tanzania, and Madagascar (Buresh, Smithson, and Hellums 1997). PR for direct application is most attractive in acid soils with high to medium P sorption capacity and preferably in combination with perennial crops being able to solubilize PR. Under Sahelian conditions, it has been found that high-quality PR will only be competitive if supplied to farmers at approximately 25 percent of the price of superphosphate (Shapiro and Sanders 1998).

Recently the World Bank and other donor agencies have considered the possibilities for large-scale investment in phosphorus. A one-time investment is, however, more relevant in soils with high P-fixing properties. Such soils are frequently found in the more humid soils of the tropics. Phosphorus application in soils with low fixing P characteristics should occur annually (Mahamane and others 1998).

Increasing the use of phosphorus must be seen as the cornerstone in developing sustainable production systems because it will produce effects beyond just higher yields. In soils with serious P deficiencies, farmers can only grow crops that tolerate low phosphorus levels. If the P supply is improved, farmers can grow a wider variety of crops, which contribute both to increasing the robustness of the agricultural production and improving biodiversity. Nitrogen fixation will also be increased, because P deficiency often seriously limits it.

for plant growth, but it has been found that increased nutrient availability can improve water use efficiency as much as three- to fivefold (Breman 1998). On soils with high run-off rates due to physical degradation, however, fertilizer cannot be used economically without accompanying measures. On such soils, use should be combined with water harvesting techniques and appropriate management of soil organic matter.

One indicator of the rate of return to fertilizer use is the value cost ratio (VCR), which is defined as the value of the yield increase due to fertilizers divided by the fertilizer cost. There is some evidence from surveys that farmers also use such a simple output/input ratio in their decisions (Donovan and Casey 1998:31). For fertilizer use to be attractive enough to induce adoption, estimates indicate that the VCR must be 2 or greater. However, recent

studies by the International Fertilizer Development Center show that the VCR needs to be 3 or above in order to also accommodate price and yield risks. Farmers' demand for such high VCRs on investments in fertilizer may be seen as a consequence of their lack of capital for investments and their limited ability to absorb the consequences of yield or price failure. Measures that would make credit cheaper and more accessible—such as through reducing the high transaction costs in providing credit to small-scale farmers—would thus be expected to contribute to reducing the high VCR requirement.

Value cost ratios calculated for maize, sorghum, and irrigated rice in Mali are 1.7, 1.3, and 4.1 respectively—indicating that fertilizer use is by no means always an attractive economic investment for small-scale farmers (Donovan and Casey 1998).

Clearly the VCR of fertilizer use can be improved in three ways:

- *Increasing product unit price*
  Reversing price policies, exchange rate policies, and tax policies that have explicitly or implicitly taxed agriculture heavily may contribute to increasing producer prices. The farm gate output price may also be increased—without increasing urban consumer prices—by measures to reduce transaction costs and create more competitive markets, such as through infrastructure development or institutional change.
- *Decreasing fertilizer cost*
  The price of fertilizers in rural areas of Africa is usually twice the international price (Bumb and Baanante 1996), but it can often be decreased by 20–40 percent through relatively simple improvements in the procurement system, such as realistic demand forecasts, selection of appropriate types of fertilizer, improved ordering, and transport systems. Farm gate prices of fertilizer nutrients can also be reduced by switching from fertilizers with a low concentration of nutrients to those with a high concentration (Quinones, Borlaug, and Dowswell 1997). This can reduce domestic transport costs by 40 percent. Efforts in many countries to increase self-sufficiency and reduce cost by producing fertilizer domestically have frequently only resulted in higher costs for farmers (Donovan and Casey 1998). There is often a vicious circle between low consumption and the high price of fertilizer: because of low demand, marketing margins and prices are high—and because of high prices, demand remains low. Breaking this circle is not easy, but promotion of fertilizer use through a time-limited subsidy may help.
- *Increasing the yield response rate to fertilizer use*
  The efficiency of fertilizer use (kilogram of grain produced per kilogram of fertilizer applied) can be increased

through such techniques as point application of fertilizer (appropriate for pearl millet and sorghum), split application, adjusted timing of application, fertilizer-responsive varieties, quantities adjusted for climatic conditions, water harvesting/irrigation, and weed and pest control. Research and extension services have important roles to play in increasing the efficiency of fertilizer use. All too often fertilizer recommendations have ignored local variability, and are incompatible with farmers' practices and resources or are otherwise unprofitable (Donovan and Casey 1998).

Fertilizer use is risky in drylands because if the rain fails, the investment is lost. Fertilizer practices must be developed to minimize the risk of crop failure. Combining fertilizer use with soil conservation and water harvesting techniques is one way of reducing the risk. Another way is point application of fertilizers. (See Box 5.3.) This reduces the cost of fertilizer use dramatically and increases the efficiency of application. Still another approach is "responsive farming," which involves adjusting fertilizer use according to realized rainfall. This has increased the profitability of fertilizer use in Zimbabwe by 21–41 percent over standard fertilizer recommendations (Piha 1993).

Increasing the efficiency of fertilizer use is the key factor for promoting its use in dryland areas. Good practices for INM will be a combination of organic and inorganic sources of plant nutrients

Box 5.3 Point application of fertilizer—The first step toward development of a more intensive cropping system in the Sahel zone?

Results from Niger have shown that applying fertilizer in the planting hole can greatly increase the efficiency of fertilizer use in millet and sorghum (ICRISAT Sahelian Centre 1998, Muehlig-Versen and others 1998). Immediately after a rain shower, 6 grams of nitrogen-phosphorus-potassium 15-15-15 is applied per planting hole. This is equivalent to 30 kilograms of this combination per hectare if there were 5,000 planting holes per hectare. The treatment increased grain yields by anywhere from 30 percent to more than 100 percent compared with no fertilizer application. Other advantages are increased stover yield and a harvest approximately 10 days earlier.

Using prices of fertilizers and grains found in the Segou area of Mali and assuming an average yield without fertilizer of 800 kilograms per hectare and an average yield increase of 70 percent, this treatment gave a VCR of 11 (Aune and Doumbia 1998). The traditional method of fertilizer broadcasting gives a yield increase of approximately 3 kilograms of grain per kilogram of fertilizer in the Segou area—a VCR of 1.2, which shows that the traditional method of fertilizer broadcasting cannot be recommended.

(Donovan and Casey 1998). This will increase efficiency and alleviate negative effects of use.

5.1.3 Principle 3—Minimizing losses of water and nutrients

In the 1990s there has been a major change in many soil and water conservation projects, from soil conservation per se to a more production-oriented approach. "Land husbandry" is the term used for this new approach (Eger and others 1996, Hudson 1992). Improvement of land resources has become the primary objective, while control of soil erosion follows as a result of good land husbandry. One important reason for this shift is the realization that in order to mobilize farmers, an immediate return on investment must be expected. Many past efforts did not increase yield much and therefore failed to interest farmers.

The main nutrient losses occur through removal with the harvested product and through erosion (Stoorvogel and Smaling 1990). To reduce nutrient and water loss, therefore, special emphasis needs to be put on ways to minimize runoff and soil erosion.

Factors affecting soil erosion include rainfall intensity and quantity of rainfall, erodibility of the soil, length and steepness of slopes, and soil cover (Young 1991). Soil conservation projects have traditionally emphasized the use of physical structures—such as terraces—which mainly reduce soil erosion by changing the steepness and length of slopes. Current approaches, however, give more attention to improving soil cover (Young 1991, Hudson 1992).

Reducing soil slope by terracing is an effective method if terraces are properly constructed. Major disadvantages of this approach are the high labor requirement and a reduction in the area that can be cultivated (Douglas 1994). Current approaches give less emphasis to complete terracing and instead promote the use of progressive terracing, which implies that terraces are formed gradually as sediments are deposited in front of a contour barrier. This can increase the fertility of the soil in front of the barriers because the deposited sediments are often rich in nutrients. The choice of barriers will depend on the circumstances.

The easiest way to establish contour barriers is to leave some strips of the land unplowed. This has been introduced with success in Swaziland (Osunade and Reij 1996). Vegetation strips can also be established, but this can be difficult in areas where there is high grazing pressure. Under such circumstances, non-palatable grasses or herbs should be used as strips. To interest farmers in planting vegetation belts, the plants should have some economic value by, for example, providing thatching material.

Where they are easily available, stones can be used as building material.

Success stories with the use of stone bunds have been reported from Niger (Pretty 1995) and Burkina Faso (Atampugre 1994). Average yield increase of rock bunds in Burkina Faso for millet and sorghum was 17 and 10 percent respectively (Kaboré and others 1994). In order to be economically attractive, however, construction of stone bunds should be combined with the use of fertilizer (Graaf 1998). Stone bunds will also reduce the risk associated with fertilizer use, as water supply is more assured.

Another simple way to form barriers is to use crop residues, weeds, or any other material that is readily available to make a "trash line." Such barriers are not very suitable on steep slopes, as they easily break. The major advantage is that they are easy to make and repair.

An indigenous soil conservation measure that reduces run-off is the zai. This technique is in use in Mali, Burkina Faso, and Niger (Ouedraogo and Kaboré 1996) on heavy and crusting soils, and consists of digging a pit about 30 centimeters in diameter and 15 centimeters deep. The seeds are sown in the pit. Farmers add some manure to the pit, attracting termites that dig canals allowing better water infiltration. The method is effective because it concentrates both water and plant nutrients into the pit. Thousands of hectares have been brought back into cultivation by using this method in Burkina Faso. One reason it has been readily accepted is its low labor requirements: it takes only 60 working days to treat one hectare.

Improving soil cover can be just as effective in controlling soil erosion as changing the slope (Young 1991). The initial process in water erosion is detachment of soil particles by the force of raindrops. Improving soil cover will reduce the velocity of the raindrops, thereby halting soil erosion in its initial phase. Soil cover can be altered by changing the crop, by increasing the yield by use of fertility-enhancing methods, or by using surface mulch.

Changing species composition from annual to perennial crops is an important way to control soil erosion. Perennial plants will cover the ground for a longer period of time and provide denser cover. It has not been very easy to convince farmers to plant trees on their farmland, however. Alley cropping, a technology to which great expectations were attached in the 1980s, has not been successful among farmers and is not recommended in drylands (Carter 1996). Institutional factors in Sahelian countries have also prevented farmers from planting trees on their land, as forest policies have denied them the right to manage trees they plant. (Forest polices are, however, being revised).

The main reason for fertilization is to increase yield, but it can also contribute to decreasing soil erosion by improving

the vegetation cover. Erosion can be cut in half at least in a well-managed maize crop compared with a maize crop grown under poor management (Roose 1977).

Another way to improve soil cover by increasing yield is to undertake appropriate and timely tillage. In Ethiopia, oxen are used for plowing. There is often a shortage of oxen, however, and the individual farmer does not always have access to the two animals considered necessary for tillage (Aune and Waktola 1998). This delays sowing, leaving the land unprotected in the early growing season. Yet research by the International Livestock Research Institute has shown that one ox in good shape can perform the task just as efficiently as two oxen in bad shape. Reduced tillage can also reduce soil erosion, because soil left undisturbed is more resistant to the erosive forces of the rain. But this method needs further study before it can be introduced in drylands.

Reducing excess water entering fields by proper management of adjacent grazing/forest land is also often crucial for minimizing nutrient losses. Overgrazing is a particular concern in highland areas. Such areas are very important for poor households, since the utilization of these resources has low entry barriers and can be started with meager means (Reardon and Shaikh 1995). Poor households often depend on this type of land for the collection of wild plants and animals and fuelwood, as well as for pasture. The land is often poorly managed and may have problems with severe soil erosion. Improved management of open access resources can therefore be particularly important.

Success has been reported with the establishment of area enclosures in the dry Ethiopian highlands of Tigray (Berg and Aune 1997) and in Cholistan Desert in Pakistan (Arshad and Rao 1994). This rangeland is often seriously overgrazed in the vicinity of the villages. Many communities have agreed that a part of their grazing land can be protected from grazing for some years in order for vegetation to re-establish. Visible results are a general greening of the environment, increased fodder availability, reduced soil erosion, re-establishment of trees that were near extinction, return of wildlife, and more permanent rivers. Constructing cut-off drains can also reduce the flow of excess water into the fields.

5.2 Water Management in Drylands

Water is a precious and limiting resource in the world's drylands. Where water is scarce, there will always be competition to use it for different purposes. Today agriculture accounts for more than 73 percent of water use in semi-arid and arid environments (El-Ashry 1993), but the share of water used this way is expected to decrease in the future (FAO 1993).

World food supply is very much dependent on irrigation; 18 percent of the world's agricultural land is irrigated but it produces 33 percent of the total harvest (El-Ashry 1993). Just as important as the quantity of water is its quality. It is estimated that 25,000 people die every day as a result of water-related diseases (FAO 1993).

A large part of investment in the agricultural sector is used to develop irrigation facilities. Thirty percent of World Bank lending to agriculture during the 1980s was used for this purpose. The performance ratings of existing and completed irrigation projects have been worse than the average agricultural project, and large-scale public-sector irrigation schemes have in general not been economically viable (Cleaver 1997). Water for irrigation is also a highly subsidized sector, and water tariffs are set below the supply cost—and often below the operation and maintenance costs. Consequently, cost recovery remains low, increasing the burden on the central government to provide capital to maintain existing systems.

Water is generally not efficiently used in irrigation schemes. It has been estimated that as much as 60 percent of the water diverted and pumped for irrigation is wasted (FAO 1993). This highlights the importance of efficiency in irrigation schemes. Promotion of good agronomic practices and efficient markets for input and output from irrigated areas can help improve the management of irrigated areas. In order to make irrigation economically viable, water should preferably be used for high-value products (Sharma and others 1996). In years when water levels in rivers become critical, however, irrigated land should be used for crops with a high water use efficiency, such as pearl millet, sorghum, and wheat, instead of rice. Water use efficiency (ton grain produced per ton of water) of wheat is twice that of rice (El-Ashry 1993).

Degradation problems in irrigation are often on-site and related to salinization. There are also frequent problems of displacement, groundwater depletion, water contamination, and water-borne diseases. Improper management of irrigation water can also raise the groundwater table, and problems attached to salinization may occur. It is estimated that 25 percent of the irrigated areas in developing countries has problems related to salinization (FAO 1993).

In sub-Saharan Africa, irrigation schemes have been developed in most larger river valleys with high state subsidies and external financial and technical assistance. Even if they are likely to remain of key importance for national food production, these large-scale schemes have often proved less profitable than small-scale irrigation managed by individual farmers with more traditional water management systems.

Less complex, small-scale irrigation schemes run either by individual farmers or by communities appear to be the most viable (Brown and Nooter 1992). (See Box 5.4.) This is especially the case when irrigation can be based on gravity. However, the initial investment cost is often too high for local communities to raise sufficient funds to build needed dams. One major problem, moreover, is that small-scale irrigation dams often fill rapidly with sediments. To avoid such problems it is important that soil and water conservation measures are in place in the dam watershed prior to its construction.

It is recommended that countries in sub-Saharan Africa move from an administrative command-and-control approach to a more participatory approach that treats water as a scarce resource (Sharma and others 1996). The main economic instruments for this are:

- Market- and demand-oriented laws, policies, regulations, and incentive structures
- Water markets with tradable water rights
- More efficient utilization of the private sector
- Economic pricing of water.

Such measures cannot be established overnight, as they are likely to encounter practical and political problems that may need considerable time and effort to be resolved.

Systems of water harvesting are old and well developed in many dryland areas of the world. With their help, enough water may be collected for cultivation in areas where average rainfall is insufficient for cultivation. They may also contribute to reducing variation in water availability to crops. (See Box 5.5.)

Box 5.4 Characteristics of successful small-scale irrigation projects

Brown and Nooter (1992) found the following characteristics of successful small-scale irrigation schemes:

- The technology is simple and low cost.
- The institutional arrangements are private or individual.
- When institutional arrangements larger than individual ownership are needed, the most effective arrangements were found to be (in decreasing order of success): extended family groups, private voluntary groups, water users associations, and cooperatives.
- Supporting infrastructure is important in order to have access to inputs and markets.
- There is a high cash return to farmers at the time they need it.
- The farmer is an active and committed participant in project design and implementation.

5.3 Animal Production

Livestock are of crucial importance to dryland tropics and on average account for 25 percent of the agricultural GDP in Africa (Sansoucy 1997). This percentage may be even higher in dryland countries. Livestock serve diversified functions: income generator, improver of diets, draft power, productive use of land not suited for cultivation, and assets and insurance against difficult times (Sansoucy 1997).

There is a tremendous variation in the way animal production is practiced in the dry tropics—from pastoralism, characterized by high mobility of animals in the driest areas, to more intensive and sedentary forms of livestock production in more humid areas (Powell and Williams 1995). There is a general move toward more intensive livestock production systems in sub-Sahara Africa. This will generally imply that the production becomes more and more demanding in terms of fodder availability, labor use, access to markets, and veterinary services and infrastructure. Intensification will also often require a further processing of animal products.

Box 5.5 Water harvesting in the Thar Desert of Rajasthan

Water has been the central force of human activities in the Thar Desert of Rajasthan, and settlement patterns are dictated by its availability. Given the scanty rainfall in this desert region, the pastoral and farming communities have devised various community-based systems of impounding rain water. Some of these systems, which date back to even AD 200, are still in use today.

"Khadin" is one such land-use system, in which run-off from a catchment is stored in fields at lower levels behind a bund. Fields immediately behind the bund typically remain submerged during the rainy season, while those at higher levels within the khadin have assured moisture for a rainy-season crop. A post-rainy-season crop is grown on stored moisture in areas that are submerged during the rainy season. Even in a drought, a rainy-season crop is assured; and in a good year, a more remunerative post-rainy-season crop can be produced.

Community khadins include the fields of many farmers behind a single lengthy bund. Soil moisture and nutrient conditions, and hence cropping possibilities, vary depending on the location of a field within the khadin. Collective construction and management of these systems requires norms for equitable sharing of benefits and costs. The norms operating in older khadins were much clearer in comparison to the problems associated with the lack of such norms in more recently built khadins. Various agencies, including the government, are trying to revive the older khadin system by giving legitimacy to the community groups that have them. The government in recent years has enacted laws to support these community groups involved in traditional water harvesting (Kolavalli and Whitaker 1996).

Intensification in most cases implies a stronger integration between crop and livestock production, which can be of benefit to both sectors. Crop production is enhanced because more manure is available and draft animals can be used for plowing and transport of harvest and agricultural inputs. Livestock production benefits because crop residues are important feed resources. The importance of crop residues as fodder increases as pasture areas become more scarce. Land shortages will therefore favor integration of crop and livestock production. An often forgotten but important aspect of integration is that intensive livestock production systems can mediate the effect of surplus crop production, as surplus grain can be used as fodder.

When moving from more extensive to intensive systems, the risk of land degradation increases. Intensification of land use without the proper input and management can lead to widespread environmental degradation (Powell and Williams 1995). Important components to improve the sustainability of the mixed livestock/crop production systems are increased fertilizer use accompanied by a return of part of the crop residues, greater integration of legumes into the farming system, and better-quality feed resources.

5.3.1 The choice of livestock outputs

The choice of livestock output as well as the composition of the herd and its size will depend on fodder availability, the purpose for keeping livestock, risk management considerations, the profitability of different livestock systems, and cultural traditions. The efficiency with which fodder resources are transformed into livestock products varies greatly. It has been calculated that pastoralists can obtain 2.5 times more energy from combined meat and milk off-take than from meat alone. For milking goats, this ratio is even more favorable (depending on production level); energy utilization of fodder in the lactation period is 24 percent whereas the corresponding figure for fattening is only 4.7 percent (Devendra and McLeroy 1982). Even though milk production may seem to be most attractive in terms of optimal use of fodder, access to markets and other economic factors may compel farmers to choose meat as the main output.

Whereas diversification of livestock species is important to risk management in dry areas, development agencies have sometimes had a one-species focus—cattle. But it is useful to recognize the advantages of other species, such as small ruminants, in developing dry land production systems.

Under conditions where the fodder resources are too scarce for each household to have milking cows, goats can be an interesting alternative. In Rwanda, there was a shift toward more small ruminants as a response to decline in grazing

area, fallow time, and average farm size (Gryseels 1988). Small ruminants, like sheep and goats, are of special importance for women when they are denied ownership to land (Sansoucy 1997); favoring these animals in development programs will therefore be of special importance for these groups.

One important advantage of goat production is that it is much more flexible than milk production based on cows. A poor household can have several milking goats while it might not be able to support even one milking cow. In cases where there is urgent need for cash, one or more milking goats can be sold, while a cow can only be sold if a major problem should occur. (See Box 5.6.) In harsh environments, goats often produce milk when cattle have dried up (Farm Africa 1998). It is also much quicker and cheaper to rebuild a stock of goats than a stock of cows if the herd should be lost for one reason or other. The time to reach reproductive age and the gestation period of goats are both only half that of cows. Goats are also able to exist on a wider variety of fodder resources than cows, as browse is usually their preferred feed (Devendra and McLeroy 1982). It is much less demanding to provide water for some goats than for a cow, and it is an animal easy for women and children to handle. Whereas goats are often accused of causing environmental degradation, this is mainly determined by the management factor. Under good management, this danger is minimal.

5.3.2 Fodder development

The importance of crop residues as a livestock feed increases with population density (de Leeuw 1997). In areas with high population densities, such as in the Ethiopian Highlands, crop residues provide 90 percent of the livestock feed.

Box 5.6 Dairy goats—A way of increasing livelihood security of female-headed households in Ethiopia?

In a dairy goat development project initiated in the Welayta area of Ethiopia in 1988, goats were provided to women on credit. The impact of the project was tested in 1994 when a drought struck southern Ethiopia. There was widespread famine in the area, but there was clear evidence that households owning goats were able to sell them and earn sufficient income to feed their families until the next harvest. As the families selected in the goat project were among the poorest in their community, the project obviously had a major impact on some of the most vulnerable groups. Total milk production also increased, and women were earning as much from selling milk as a daily laborer. The project also improved the quality of family diets.

Source: Farm Africa 1998.

Under such conditions, improving the quality of stover is an interesting option.

The quality of crop residues is often so low that these provide only energy maintenance of livestock. But there are several ways to increase the quality. One is to treat the residues with urea. This increases digestibility, raises the nitrogen content of the straw, and increases voluntary intake over that of untreated straw, usually by 25–50 percent (Preston 1995). Animal urine can also be used, provided that it contains enough nitrogen. The treated straw can be used after two weeks in dry lowlands, and after three to five weeks in mountainous tropical regions.

Many experiments show a positive effect of urea treatment. The relative increase in production is in general greater for the lower production levels than for the higher. In Niger, milk production rose from 160 to 300 liters per cow during a four-month period when cows were provided an evening feed ration of urea-treated straw. Treatment can also greatly enhance fattening of animals. In 17 trials, weight gain per day averaged 38 grams and 235 grams respectively when non-treated and urea-treated rice straw were used (Chenost and Kayouli 1997). Urea treatment is widely used in China and has been successfully introduced in some villages in Mali (Speirs and Olsen 1992).

Urea can be used both as soil amendment and as a way to improve the quality of crop residues. Resource-poor farmers who cannot afford to use urea for both purposes will have to consider the relative merits of each use. The choice will depend on such factors as the price ratio between crop and animal product, crop response to fertilizer, effect of straw treatment on animal production, and the need for straw as a soil ameliorant. However, there is in general a low economic risk involved in using urea to enhance the quality of crop residues, as the treatment is rapidly transferred into an economic output (milk or meat), and it is independent of climatic variation, which is not the case when urea is used as a fertilizer.

Pasture development and planting of fodder trees has turned out to be very difficult in dryland areas because of high grazing pressure. Fodder development in such areas will therefore always have to start by changing grazing practices. This can be achieved by establishing fences (made, for example, of thorny shrubs), changing to zero-grazing or controlled grazing, or adjusting livestock numbers. If such measures are in place, planting fodder trees and establishing pastures becomes an option.

5.3.3 Animal traction

Traction animals can serve several functions, including reducing the drudgery of cultivating fields and transporting agricultural input and output. Animals also ensure people's mobility if there is a need to migrate.

High crop prices, cash crop production, and availability of land, combined with provision of extension and credit services, have been found to promote animal traction in Africa (Speirs and Olsen 1992). An example of this is the introduction of animal traction in relation to the expansion of groundnut production in Mali and Senegal in the 1950s and 1960s. The main effect in the Sahel is an expansion of the cultivated area (Speirs and Olsen 1992).

Different types of animals—such as oxen, cows, horses, mules, and donkeys—can be used for animal traction. Oxen have the highest draught force, but are also the costliest to buy and the most demanding to keep in terms of fodder availability. Oxen are usually used in pairs when plowing, but only for a very limited time during the year. Oxen usually confer a lot of prestige on their owner. Cows can also be used in animal traction and have the advantage that they also produce milk. The use of cows for animal traction is a debated issue, because if fodder is not available in sufficient quantities, using cows for animal traction can have a negative effect on reproductive capability and milk production (Jobbar 1993). Donkeys can also be used for plowing, but are much less prestigious than oxen. They are renowned, however, for exceptional survivability, longevity, low cost, and low management requirements.

There is a strong tradition for animal traction based on oxen in the highlands of Ethiopia, and hardly any other animal is used for plowing. The ox is also the main animal used for traction in South Africa, but there has been a development toward more use of donkeys, even for plowing. This has also been seen in Burkina Faso (Speirs and Olsen 1992), where it has taken place as a result of inadequate grazing area and pasture degradation that has made it difficult to keep cattle (Starkey, Jaiyesimi-Njombe, and Hanekom 1995).

The desirability of the strong position of oxen in dry highland agriculture can be questioned. There is a tendency toward reduced farm size—in Tigray in northern Ethiopia, for example, average farm size is only 0.5 hectares. With such small farms, it seems unrealistic that each household can keep a pair of oxen. Plots of this size can be cultivated with a hoe or with less demanding animals, such as donkeys. This will also make more fodder available for more productive animals such as milking goats. Female-headed households could in particular benefit from such a development because it is not culturally acceptable to have women plow with oxen, and the men who plough for women-headed households often claim more than 50 percent of the harvest. Donkeys, on the other hand, are more gender-neutral animals and have more

uses. They can be used to transport water, for instance.

5.4 Research and Extension

There is a general need to invest more in agricultural research in sub-Saharan Africa in order to guide policies and help farmers develop relevant technologies for their particular agro-ecological and socio-economic circumstances. An increase in investment in research is a prerequisite for developing more productive and more sustainable agricultural systems. But an increase in investment is not sufficient. How the resources are used is also important. The strong focus on locally appropriate solutions highlights the need for research to be more participatory. Farmers have to play a bigger role in research priority setting and in determining the merits of research findings.

There have been numerous attempts from national research and extension systems, international research organizations, and nongovernmental organizations (NGOs) to introduce new technologies to smallholders in Africa. Many of these have failed. Agriculture among smallholders in Africa is still mainly a subsistence venture characterized by low production, high rates of losses of nutrients, and low purchase of inputs. Development projects often succeed in introducing a new technology during the project period, but then farmers commonly return to the traditional technology later. There are many reasons why these past efforts have failed. Market access, cultural traditions, land tenure, high labor requirements, and monetary requirements are major causes, but the way these technologies have been introduced to farmers may also have contributed to the failures (Chambers 1997).

Traditionally in agricultural research and extension a technology is more or less finalized before farmers get to see it. This has probably contributed to some of the failures. The obstacles farmers face, such as financial and labor constraints, are not experienced at the research station. The extension system for the introduction of new technology has often been based on the diffusion system. Information is transferred from the researcher to the extension worker and from the extension worker to farmers. The feedback from the farmer to the extension worker has often been low. Researchers have often had limited information about the complex problems facing farmers. On-farm research in connection with such a system has often been planned and implemented by the researcher, or at best planned by the researcher and implemented by farmers. The result has been that recommendations have frequently not been appropriate to farmers' problems and needs.

In the 1990s there has been a rapid development of participatory research and extension systems that can be characterized as more demand-driven. (See Figure

5.1.) The establishment of farmer research groups is a key element of this approach. Farmers meet to solve a common problem, and the researcher and extension agent play the role of facilitator in this process (Chambers 1997). Mutual exchange of information among farmers and between farmers and researchers and extension agents is a prerequisite for success. Important principles for the formation of such groups are (Pretty 1995):

- The use of catalysts (resource people) if people are not already organized
- An informal organization at first that evolves into a formal structure
- Farmers' representatives and village extension agents chosen by consensus
- Small groups
- A problem solving approach
- A limited number of tasks to start with
- Farmer-to-farmer communication and learning
- Self-reliance in planning.

Farmers' own experimentation is a central element in farmer research groups. This is not new, as it has been realized for a long time that farmers continuously modify and develop new technologies. The approach described allows greater flexibility in the research process and can increase the range of topics under joint investigation (Pretty 1995). The most difficult task in developing a participatory research and extension system is probably changing the attitudes of researchers and extension agents. Their organizations must transform from teaching organizations into learning organizations. Some of the new initiatives will fail, but it is important that such failures are accepted and considered an integral part of the learning process.

Experimentation by farmers should start slowly, as there may be a high economic risk involved. When confidence in new technologies is gained, the technologies can be used on a larger scale.

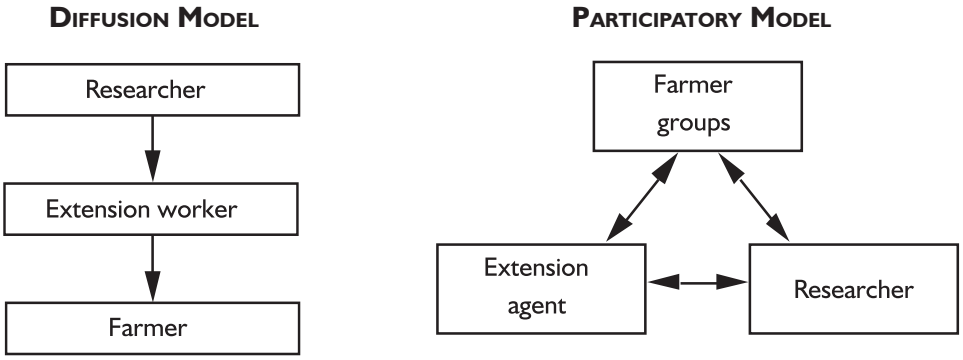
Increased collaboration and communication between researchers and farmers need not threaten the importance of researchers or the scientific quality of research performed as long as the unique competencies and capacities of various participants are recognized in the research process.

5.5 Good Practices in Dryland Agriculture

The process of creating a more sustainable and productive dryland agriculture requires public action along numerous fronts. Many of these are not usually conceived of as being part of the agricultural sector. Thus improved education at all levels will play a vital role, as will increased investment in research and extension and in infrastructure. Factors such as a stable macroeconomic situation, a conducive legislative framework, and maintenance of the rule of law are also important.

A crucial aspect of agricultural development is to strengthen local markets

Figure 5.1
Differences in extension system between the diffusion model and the participatory model



for inputs and outputs. All too often donor projects and governments have taken over the role of the local merchants or cooperatives by supplying inputs to agricultural production. This can erode the market for local merchants, with the result that when the projects phase out, no one continues to supply necessary inputs. Efforts should instead be directed toward strengthening local markets' capacity to supply agricultural inputs. Most important is that donors and governments refrain from actions that create uncertainty for merchants and that obstruct market development. Active assistance could mean providing loans to merchants or cooperatives; training merchants or co-operatives in the supply of agricultural inputs (quality issues, how to store, possible markets, prices, advertising); and informing farmers about the usefulness of different agricultural inputs. Maintaining and improving rural infrastructure is a public responsibility of great importance for developing rural markets.

Specific strategies will need to differ among areas. Table 5.1 indicates how priorities may vary according to remoteness from markets.

The choice of agricultural technology will depend on the level of market integration and agro-ecological characteristics. Organic sources of nutrients are in best supply in areas cultivated in urban centers (because of access to by-products from processing of agricultural products, household wastes, and night soil) and in remote areas where the ratio between outfields (pasture areas and forests) and cultivated area is high.

Using irrigation and fertilizers requires market integration, making such practices most appropriate in areas with fairly easy market access and reliable input supply. In more remote areas, where prices of purchased inputs are higher due

Table 5.1 Appropriate policies and technologies for agricultural development in different dryland areas

	Peri-urban agriculture	*Agriculture with easy market access*	*Agriculture in remote areas*
Policies			
Development of infrastructure	0	+	++
Strengthening input supply	+	++	+
Institutional development for the management of common resources	0	+	++
Technology			
Organic sources of nutrients	++	+	++
Inorganic sources of nutrients	0	++	+
Integration of animal and crop production	0	+	++
Irrigation	++	++	+

Note: 0=less important, + important, ++ very important.

to high transaction costs, the role of local inputs will increase. Even in such areas, however, fertilizer and irrigation cannot be ruled out if the value cost ratio is favorable.

A major challenge to improving plant nutrient supply in the more remote areas is to improve the integration between crop and livestock production. Remote areas often have large grazing areas but low animal production due to the low production of pastures and lack of feed concentrates. To increase the productivity of pastures, animal husbandry will have to develop toward controlled grazing and zero-grazing in areas with permanent agriculture.

More work is required to develop technologies that may increase agricultural productivity in the drylands while preserving the resource base. Furthermore, solutions have to be appropriate to farmers' needs and constraints. There has to be better communication between farmers, researchers, and extension workers in order to improve research priorities and extension messages. Farmers must be involved in technology development from the initial stage of defining priorities. In many countries, especially in sub-Saharan Africa, the national agricultural research system requires a boost in resources. Very often capacity is insufficient even to benefit from the contributions made by the institutes that belong to the Consultative Group on International Agricultural Research or to influence their research priorities.

CHAPTER 6

Community-Based Natural Resources Management in Dryland Agriculture

Community-based organizations are typically resource user groups, local management committees, villages and village councils and associations, communities, or a set of communities that have some degree of common identity and co-operation based on proximity, social and economic interaction, and interdependence in use of resources (Uphoff 1998). One important characteristic is that community-based organizations have members. They operate in the "middle sector" between the state and private sector (sometimes as part of these sectors). They should be held separate from NGOs, although they may work in concert with them. Agencies and actors of the central government are as a rule separate from those of the local government, who in principle are more directly accountable to local people and groups. There are typically close linkages and interdependence between the various organizations and institutional arrangements of a combined resource regime.

6.1 The Potential Capacity of Community-Based Groups

Experience shows that there are certain conditions under which community-based natural resources

management can succeed, while under other conditions or for other objectives or functions, they are less successful.

Community-based NRM implies a system or process in which local knowledge, norms, and institutions evolve together over long periods of time with an ecosystem (Uphoff 1998). Such regimes are often well attuned to the local environment. They can be efficient in drylands management for several reasons:

- Most of the decisions and actions that directly affect natural resource management are made at the community level, where knowledge about resource dynamics is found.
- Community-based groups reduce costs of state enforcement and management.
- Community-based regimes may be perceived as legitimate tenure systems.
- The focus on community-based development can improve state responsiveness to local needs, ideas, and people.
- Small farms and herd units have often proved to be more dynamic and efficient than larger commercial farms or ranching schemes in the use of land, labor, and capital.

But there are also limitations to community-based regimes. Although old and autonomous groups often function well, creating new groups where none exists is difficult. Furthermore, such groups are not necessarily committed to the same goals of conservation (such as biodiversity conservation) as the international community. They are also vulnerable to external pressures. As such pressures mount from climatic change, population growth, new technologies, market integration, or political maneuver by states or external elites, community-based regimes often face increasing problems in maintaining legitimate and effective management (although they are still likely to play important roles). Higher-level support may then be needed to manage resource use conflicts between diverse user groups. (See Box 6.1.)

6.2 Gender and "Bundles of Rights"

Communal property rights systems are generally very complex. Property rights are social relations that are defined through the political interaction of various user groups at all levels of social organization. Rights to resources consist normally of a "bundle of rights" divided along resources and functions, and according to social status position and organizational hierarchies of society. The distinction between control over various bundles of rights is important in order to understand fully the gender differences in land ownership.

Seeing households as bounded units characterized by relations of sharing, equality, and cooperation often obscures intra-household differential access to resources. Women and men have differ-

Box 6.1 Strengthening community-based resource management in Rajasthan, India

URMUL Trust is an example of NGO interventions in local institution and capacity building in the arid and semi-arid regions of Rajasthan, where local villagers are encouraged to participate to overcome the constraints such as caste structure. This NGO, based in the desert district of Bikaner, started up with fodder farming activities after the severe drought and food security crisis in 1987. Fodder development was initiated on village grazing lands with several objectives:

- Increasing the production of fodder, particularly during droughts;
- Creating possibilities for local employment;
- Containing encroachment on village grazing lands for cultivation purposes;
- Developing institutions for common property management.

The villagers had use rights and management responsibility, while the NGO acted as a facilitator in the process of institution building. The NGO intervention has supported development of local user groups, although the responsibility of management remains somewhat unclear. Traditional activities such as management of village grazing lands and water harvesting in the drier tracts of Rajasthan were undertaken by villagers through traditional institutional arrangements. Shramdaan is one of them, in which villagers, including the headman, contribute voluntary labor on full moon days. Such institutions are being weakened, however, partly because of government interventions through employment generation schemes and free goods and services. In this case, the NGO is trying to revive the traditional resource management systems for common property management.

entiated economies that do not necessarily imply sharing, equality, and cooperation—even within households. In most cases, both men and women have access and use rights to land and rights to make improvements on the land. But women have much less control over other property relations, such as land management, sale, and inheritance. Property rights are typically divided according to the resource. The right to cultivate may be held by one person or group; trees and tree resources (wood, fruits, fodder) might be used by another person or group; agricultural residues may be used by a third person or group; and remaining rights (for mining, for example) might be held by the state. The distribution and content of tenure rights may be reshaped in important ways by government policy and project interventions. (See Box 6.2.)

6.3 Diverse Community Groups

Communities are not necessarily clearly bounded social or geographical units, nor are they likely to have common or agreed interests in resource management (Uphoff 1998). Community-based groups are normally relatively diverse and characterized

Box 6.2 **Gendered tenure rights on the Gambia's North Bank**

In the early 1980s, after a decade dominated by annual rainfall 25 percent below long-term average levels, rural families along the Gambia's North Bank found themselves in dire straits. Rice production levels were in steep decline; imports of this principal staple were growing rapidly and its consumer price was up sharply, while the price for groundnuts—the principal export crop in the Gambia River Basin—was low. These changes set the stage for three competing development initiatives: one involving small-scale market gardens managed by women, a second centered on fruit tree orchards largely controlled by men, and a third emphasizing rice plots managed by women for joint family consumption purposes.

The slumping groundnut economy meant that male farmers encountered increasing difficulty in meeting their customary household budget obligations. To meet the challenge of supporting themselves and their dependents, women began converting low-lying land rendered marginally productive by drought conditions into lucrative, hand-irrigated vegetable gardens. They were aided by small grants from agencies interested in "Women in Development" issues and by efforts by the state, NGOs, and voluntary agencies to diversify the rural economy in response to drought. A full-scale although geographically uneven market garden boom was soon under way.

In the second wave of development initiatives, male landholders took advantage of a renewed developmental emphasis on environmental stabilization. Lineage heads and elders who controlled low-lying land were urged by forestry department extension agents, NGOs, missionary groups, and large-scale donors such as USAID and the European Union to establish orchards and wood lots in order to reverse deforestation and reap the economic benefits of fast-growing exotic fruit and firewood species. Projects were either superimposed on women's existing garden sites or established on new sites where women had access to land only if they watered landholders' trees and vacated the plots when the trees matured. Thus the projects took maximum advantage of the newly productive landscapes created by the garden boom.

The "natural" succession of species on the plots produced shifts in labor claims and property rights, giving privileges to the older claims of male landholders over more recent and less secure usage claims of women gardeners. In effect, they allowed male landholders to resume control over territory they once controlled more exclusively. Thus groups of women gardeners quite successfully, aided by the financial support of developers, acquired usufruct rights to valuable land and groundwater reserves. For the better part of a decade, these gardeners deepened their involvement in market gardening and gradually expanded their land use rights, only to have male lineage heads "re-claim" the land resources through NRM-related agroforestry and soil and water management projects.

This case illustrates how shifting development initiatives and policies can undermine local processes of change that benefit previously marginal social groups. In the local communities in The Gambia River Basin, women and men benefited differently from the two waves of development initiatives. While the women got access to and control over land and its yields in the wake of initiatives related to Women in Development policies, men regained control over the same land in the wake of natural resource management policies. This example brings to the surface the importance of investigating gender relations in access to and control over vital natural resources, and in systems of redistribution within and beyond the household.

Source: Schroeder 1997.

by struggle and competition as well as by agreement and cooperation. Interests in resources and their use are likely to differ and be conditioned by political processes and power relationships between influential groups in the community. It is not only who is in control of the natural resources per se that is important for their management but who controls the labor, technology, and capital necessary to use natural resources—that is, the total entitlement situation of various users. The degree of social differentiation and organization of social groups is central to determining motives and directions for social organization and institutional change.

Differences in power and interests in resources may create tensions and resource conflicts. This may also relate to control of labor. Such conflict can often be destructive, but may also bring society forward in the sense that more-efficient or equitable regimes are produced. A key point is that conflicts, especially when larger social groups are involved, are not easily handled within the community realm. They may cause demand for intervention by actors at a higher level of social organization. Hence, a diversity of institutions with different forms and functions operating from local to national and global levels might be required to regulate access, resolve conflicting claims, and supply new institutions (Leach, Mearns, and Scoones 1997; Shanmugaratnam and others 1992).

Some of these problems of community-based natural resources management have created practical problems for governments and donors involved in local capacity building. A key challenge is to identify what socio-geographic units can function and work for what sort of purpose. Small groups might be needed for management of wells, while rangelands and watersheds require community-wide or inter-community management.

6.4 World Bank Lessons from Community-Based Natural Resource Management

Community-based natural resources management was a response to what were perceived as fairly top-down, technocratic, inefficient projects of the 1970s and early 1980s. Local concerns, the complexity of social and environmental systems, and goals of empowerment and sustainability were seen as insufficiently incorporated. This new generation of projects was built on the recognition of weak performance of sectoral projects and integrated rural development projects.

The involvement and empowerment of local communities in the design and implementation of NRM is the most frequently cited factor for project success in the community-based land management—or Gestion de Terroirs approach—supported by the World Bank. Improved community-based natural resources man-

agement was initially the major thrust of the projects, but they slowly moved toward broader goals of managing community land, in recognition of the importance of local capacity building, land tenure, and the "need to respond to people's priorities." Social infrastructure typically became a supportive element, due to its high demand, and was to some extent provided in order to foster NRM, which was the main goal of the intervention. Social services, such as provision of wells or a local school, were therefore used as incentives and ways to develop an initial "rapport."

More specifically, the objectives of the Gestion deTerroirs approach are typically to provide communities with the operational capacity to initiate and implement activities designed to improve production, quality of life, and the natural environment, and to provide communities with the authority and administrative and legal power to manage the resources of their land.

Ideally, the approach is assumed to be participatory, flexible, and iterative. The elements included in the approach will vary from one setting to another. Typically the following elements are included, all dependent on a supporting national policy and institutional framework:

- Participation
- Coordination between various stakeholders
- Tenure security
- Decentralization
- Local capacity building
- Support for special groups' interests (women, youth, pastoral migrants)
- Supporting investments in social infrastructure
- Flexibility in design in order to allow for learning and re-evaluation.

By using techniques from participatory rural appraisal, village communities interact with project field staff in the planning process. They express their needs, priorities, and constraints, based on their knowledge of their land and its resources and perceptions of ways to solve their own problems. The approach is global (intersectoral) by addressing potential complementarity of activities within several sectors. It is also interdisciplinary through acknowledging interrelationships among environmental, economic, social, and demographic factors. Following an initial "diagnosis," the approach builds on land use plans that through different planning stages and levels of approval define the agreed management objectives and means to reach them in the short and longer term.

The approach must, according to Lewis (1997), acknowledge three key concerns:

- Effective assistance to poor African rural households must address issues crucial to food security and survival before tackling longer-term problems.
- Sustainability must be considered as durable capacity to respond to social, ecological, and economic change, not

the capacity to maintain any one specific equilibrium or static condition between people and resources. Social and ecological systems are highly dynamic and often driven by external influences, whether climatic or human in character.

- Both African terrestrial ecosystems and African societies are much more resilient and dynamic under pressure than is often believed.

Emerging results and lessons from several community-based NRM projects considered successful by the World Bank are summarized in Box 6.3.

There are some problems with this approach, however. It is often considered too slow, too costly, and too complex—thus limiting the number of communities that can be reached. The present complex procedures and processes for developing land use plans have in many instances made it difficult for communities to comprehend, assume responsibility, and follow up. These concerns have made the Bank develop measures to simplify the approach, enlarge the intervention zones and number of villages, and aim toward national rather than regional programs. The approaches for developing village land use plans are simplified, fewer activities are financed, the number of field agents is increased, and efforts are made to link the program with the national extension system. These systems build on training and visit approaches, with a fairly different philosophy in terms of participation.

Some attempts are made to develop complementarity between the two approaches, however. Agricultural extension supported by the World Bank now focuses on broader aspects than improved crop production technologies, such as animal production, crop-livestock integration, and on-farm soil and water conservation. Experience in the field, however, suggests that change of technology is constrained at various levels, foremost by lack of labor and capital at farm level, but also by weak supply of inputs and access to markets.

Measures taken to accelerate and scale up the process and to concentrate activities just on NRM inevitably risk reducing the quality of operations (Lewis 1997). It is argued in World Bank documents that the involvement in other sectors than NRM has "substantially diluted the initial focus on the management of agro-sylvo-pastoral ecosystems and has led to frustration and disappointment for those who consider that natural resource management should be the priority concern. The problem is that many communities have not agreed with this analysis. Nonetheless, there is room to consider whether a particular effort should not once again be directed toward this particular aspect of land management" (Lewis 1997). Lewis suggests that in the long term, problems of social services and rural in-

Box 6.3 Keys to success in community-based natural resources management

Community-based NRM projects following the Gestion de Terroirs approach have been under implementation since the early 1990s in several West African countries, including Benin, Burkina Faso, Côte d'Ivoire, Mali, and Niger with funding from IDA and several bilateral assistance agencies. Pilot projects in Chad and Guinea also have significant NRM components. New projects are being launched, for example in Mauritania, and the interest in the approach is spreading to East Africa and Asia.

A main aim of these projects is to "reinforce common property management systems, with the dual objective of alleviating poverty and improving the management of (crop) land, water, pasture, and forest resources." The projects attempt to link with agricultural services aimed at productivity increase on individual farm plots and to national social services (health and education). There are several positive results reported so far:

- Local communities have rehabilitated village land through soil and water conservation measures (Burkina Faso, Mali), and improved pasture (Chad) and forest resource management (Burkina Faso, Niger).
- Some projects have helped resolve land conflicts, both between farmers and herders within the community and between local communities and outsiders.
- Local community involvement has improved the management of not only collectively owned lands but also government-owned forest reserved for biodiversity conservation (Burkina Faso, Mali).

Lessons learned from these projects can be of general relevance, the most important being observed changes in behavior and capacity of the target communities to plan and negotiate improvements and voice common concerns more clearly. Emerging lessons are that:

- Participatory rapid rural appraisal techniques combined with village land use planning are powerful tools for helping communities identify their needs and make marginal social groups participate, but they require modification if programs are to be accelerated and extended.
- Rural communities can bring bottom-up solutions to land tenure and other natural resource management problems, provided a proper institutional environment is in place, including firm government commitment.
- Innovative legal and regulatory measures suggested by local resource users should be tested by governments before embarking on larger-scale implementation.
- Improved NRM requires governments to recognize and, if necessary, help enforce locally designed solutions.
- Successful local-level management of natural resources requires investment in community-level capacity building and empowerment in the areas of organizational and financial management, and thus requires longer time than is normally allowed for in donor-supported projects.
- The Gestion de Terroirs approach can become an efficient vehicle for coordination and institutional change from national to local levels, and in relation to implementation of National Environmental Action Plans aimed at improved drylands management.

Source: Lewis 1997.

frastructure can only be resolved through more efficient decentralization and greater involvement of the line agencies concerned (education, health, public works).

There is also concern about the limited local capacity, in part reflecting inadequate administrative support and transfer of responsibility. It has proved considerably more time-consuming than initially planned to build local management capacity within communities where illiteracy rates are high. Problems with the creation of local government across Africa is one indication of how much time it may take to build viable village community structures and groups that will undertake economic planning, budgeting, and accounting. This has impeded project progress and made results on the ground difficult to measure. The most important result so far, according to Lewis (1997), is the changes in behavior and capacity of the local communities concerned.

6.5 Critiques of the Community Development Approach

A main issue of the outside critique is the degree to which the Gestions de Terroirs (GT) approach is geared toward key local priorities. In the Sahel, these are often social and infrastructure improvements rather than some "communal" natural resource conservation activities such as sand dune stabilization, tree planting, or protection of pastures (Shanmugaratnam and others 1992, World Bank/OED 1998, Aune and Grimstad 1997). Only when there are direct short-term benefits is there likely to be substantial participation. But there are also other problems, most of which are addressed in Bank reports but are not necessarily easy to take into account in practice.

The approach, for example, is unsuited to pastoralist areas, where geographical limitation of "community land" will reduce mobility and flexibility in resource use. In addition, since the initiatives for establishing the community-based institutions come from above, the progress and success of local capacity strengthening will depend on how quickly and effectively this initiative can be turned into a broader participatory process. This depends on the identification of "rallying points" or key operations or support programs around which community institutions can be formed and mobilized. It also depends on program design and capacity and on commitment to the program from all parties concerned.

Community capacity building in natural resources management must be sensitive to local priorities. The approach must recognize that local people and community groups have their own perception of environmental problems, as well as about which management objectives should be given priority. If NRM is not a high priority locally, less emphasis should

be placed on developing land use plans and control of territories through tenure contracts, and more placed on other aspects of development. It is likely that the GT approach has less relevance, or must be adjusted considerably in certain eco-zones, for example in the drier ecosystems, where pastoralism dominates. Here a focus on conflict management, access to key resources, and provision of services (wells and health) becomes essential.

It seems that the Gestions de Terroirs approach is often based on assumptions that there is widescale environmental degradation going on mainly as a direct result of population growth and human activities. There is little acknowledgment of the uncertainty regarding extent, severity, and causes of drylands degradation—for example, related to the relative impact of climatic and event-driven processes versus human factors. Fear of overgrazing might have been overestimated. Likewise, environmental impacts from overcultivation might also have been overdramatized. One of the main concerns of GT projects has been better fuelwood management. But the concern that local firewood use causes deforestation seems overstated (Benjaminsen 1997).

The GT approach, as it operates in Mali and Burkina Faso, has proved to be complex and rigid. Its operation has depended too much on external assistance, especially the process of working out land use plans. Participatory appraisals by project staff are done in mechanistic ways and only in the early phases of the project. There is too much focus on technical aspects of analysis of village resources and on the development of land use plans, which can often become too much of an end in itself. This means that this approach easily ends up being a planning tool for state services rather than village plans meant to serve the village community and village priorities. It seems that much simpler plans are needed if they are to be useful and revised regularly.

It is important to establish why village communities really demand or want the Gestions de Terroirs projects to develop village land use plans. Spontaneous requests by village communities for the project to assist in developing plans have been observed. But such requests can be interpreted in several ways. It may be an indication that people perceive the land use plans as useful planning tools for NRM within the community. It may be seen as a way to increase the power of the community in access control, by denying outsiders access, in other words. But the provision of local autonomy and decision-making power of village authorities may also go to the heart of the relationship between a state government and its people, as a first step in building genuine dialogue and trust between the state and local groups. The requests may also simply be a reflection of "shadow partici-

pation." It is not the plans per se that people are after, but rather other potential benefits from the project activities. People may also be afraid of negative sanctions from authoritarian state agents if they do not participate.

The GT approach builds on the assumptions that a land tenure contract, in the form of a signed land use plan, provides higher tenure security at the local level and thus increased willingness to invest in improved natural resources management. The higher security is assumed to arise from the state granting local leaders and committees more prominence in resource management decisions. However, tenure agreements in the Sahel are typically settled through continuous negotiation, not through any "once-for-all" contract (Berry 1993). Access to land is mostly relatively secure already within local village communities. Furthermore, there is little evidence from Sahelian Africa to support the assumption that more secure tenure of this sort automatically leads to higher (labor) investments and improved rangeland or cropland management. Constraints on the use of more productive technology arise foremost from other relationships, such as weak infrastructure and access to markets and technology, long distances, inefficient markets, high transaction costs of trade, low population concentrations and demand for produce, and disabling government policies (Platteau 1995a, 1995b; Le Roy, Karsenty, and Bertrand 1996; World Bank/OED 1998).

These community-based approaches have had limited effect on coordination and capacity strengthening at district and provincial levels (Lewis 1997). This illustrates some of the problems such regimes face in addressing management of wider resource systems, such as watersheds or catchment areas. Various social groups have much larger action space and engage in non-land-based activities well beyond the community boundaries. The approach does not equip social and economic entrepreneurs with new skills and information to meet new challenges growing out of urban markets and economies. There are also external actors, such as private entrepreneurs or state officials, who through ties to state agents or local leaders may obtain access to "community" resources, thus undermining local management systems.

Community-based regimes are built from social systems that are generally open systems, with internal rivalry and struggle over access to resources. Potential benefits from decentralized resource management easily end up being captured by local political and economic elites. Local leaders are not accountable in democratic ways and do not take decisions in transparent manners compatible with more democratic ideals. But there are several important reasons why customary leadership has comparative advantages in

taking a lead role in coordinated resource management (Baland and Platteau 1996, Vedeld 1997:312). These individuals normally live close to the resources. They have intimate knowledge of the dynamics, productivity, and resilience of the resources. They know local people, particularities of different interest groups, and general circumstances for management. As customary leaders with an ascribed genealogical status, they often carry prestige and garner respect. Provided they have the personal capacity needed and perform according to expectations, they may create trust. Overall, they may reduce conflicts and lower transaction costs of enforcement.

Certain fundamental reasons why local groups demand tenure rights and conflict resolution by third parties should be accepted. These go beyond a need to safeguard particular investments and to the heart of the relationship between the state and the people. Until recent democratic and decentralization reforms, there has been little in the official land tenure laws telling herders and farmers that the state is willing to stand up for the territorial rights they have fought for through history and that by and large are recognized locally. On the contrary, the state has in law and practice often made tenure less predictable and secure. Local people perceive the state expropriating land for crop cultivation, penalizing people for grass burning or collection of fuelwood, unduly restricting transhumance and shifting cultivation, and regulating conflicts in unpredictable manners. People often distrust their government and the judicial system and have little notion of a constitutional government that is democratic and "fair." Hence, the broader institutional agenda is to build such a constitutional (democratic) government that can guarantee the rule of law. This is a long-term political program that also requires a gradual reconciliation of custom, customary rules, and institutions with statutory law and state institutions.

6.6 "Good Practices" for Community-Based Regimes

It is difficult to establish a general critique of the Gestions de Terroirs approach since it takes many different forms. It has clearly been relatively successful in some countries, but faced problems in others. It has the ability to renew itself and appear in constantly new forms. There are certainly experiences from community-based NRM, building on adjusted approaches, and co-management systems that can be used as "good practices." (See Box 6.4.) Many of the "good practice" recommendations for pastoral association building are also valid here, although approaches toward pastoralists would normally be different from those toward farmers.

Box 6.4 "Good practices" in community-based resource management

Build on a solid information base on the dynamic relationship between resources, community actors, and external arrangements.

Maintain the objective of alleviating poverty, without compromising on needs to foster sustainable land use.

Respond to and target investments to local priorities through participatory and continuous dialogue.

Address land degradation from the perspective of the local stakeholders—both on individual farms and related to common-pool resources; provide support for activities with medium- or long-term benefits that poor people and communities cannot easily afford to undertake themselves.

Broaden the scope of agricultural extension to encompass environmental and civil education concerns related to information about decentralization, land rights, democracy and human rights, and ways of lobbying and participating in socio-political arenas of society.

Encourage people to organize themselves better and to build capacity in face of changing circumstances, to create social infrastructure, and to become more active in building social groups internally and voicing claims externally.

Whenever feasible, develop a national program in order to enlarge the possible impact, but concentrate on zones where key resources, key degradation problems, or important conflicts occur, and where there are willing and capable communities.

Ensure that interests of marginal groups or pastoralists are taken into account.

Introduce national training and information programs for staff and local people to show how community-based development can accompany and reinforce the decentralization process; foster systematic institution building and commitment.

Involve other sectors more effectively at national, regional, and district levels to complement drylands management; this could entail decentralization and participation within the livestock and extension services, for example, or engaging national programs within social sectors.

Overall, there is a need to focus on the enabling institutional framework at the national level while working at community levels toward simplification, cost sharing, and cost reduction; managing key resource systems rather than all resources; and directing support for social and environmental development to motivated communities and regions. Extension of the approach requires modification of the way in which donors such as the World Bank work with their clients, in terms of participatory approaches and formal procedures (for example, whether local groups are to

handle project budgets). The Bank has to accept further trial and error due to the complexity of intervention and uncertainty related to the rapid and dynamic ecological and social transformations being observed, albeit not quite understood.

In summary, a participatory approach to drylands management is generally fostered by:

- Improving local capacity by building on local knowledge and institutions
- Decentralizing authority
- Constructing social and physical infrastructure
- Creating appropriate national policy and legal frameworks
- Building political commitment and attitudes.

CHAPTER 7

Drought Preparedness and Risk Mitigation

Droughts are certain to occur in the drylands. These lands are characterized not only by low average annual rainfall but also by large variations in rainfall. A drought's severity depends on how much below average the rainfall is and how long it takes before above average rainfall is received. The social and economic effects of a drought depend on factors such as its spatial distribution and extent and the diversity of resources and eco-zones affected. Key resources such as water, pasture, woody vegetation for browsing, and crop residues may be affected differently, as will different eco-zones. Last, the social effects will be influenced by the level of drought preparedness and the effectiveness of the coping strategies utilized by individuals, households, local communities, and the nation as a whole.

For survival, people living in drylands have developed drought preparedness strategies or coping mechanisms. These vary by region, community, social class, ethnic group, gender, age, and season (Frankenberger 1995). Poor households in general have less ability to deal with stress because they have fewer and less adequate coping strategies. It is important to understand the drought management

strategies of local people in order to provide assistance efficiently.

It is useful to divide strategies into those used in advance of and after a drought, with the latter subdivided into early and late strategies. The first set of strategies consists of measures aimed at reducing drought exposure and increasing drought preparedness. They include diversification and mobility of assets and income sources and investment in various social claims. Accumulation of wealth in the form of livestock, diversified in terms of species[4] and often spread in different herds as part of mutual lending agreements, is a common measure for risk preparedness. Other measures include diversification of cropping and a combination of cropping and livestock holding, in addition to holding wealth in the form of grain stores, jewelry, or bank deposits and investment in various social claims.

Agriculture-based strategies include water harvesting technologies, cultivation of drought-resistant and early crop varieties, storage of fodder, and off-season gardening. When droughts are local, livestock mobility plays a special role. By moving herds it may be possible to find less affected areas. Limitations on pastoralists' mobility (due to closing of national boundaries, for instance) may thus increase their drought exposure.

Effectively reducing risk exposure through asset diversification requires that the different assets are not exposed to the same risks. During drought, the value of assets such as livestock and jewelry may typically decline, whereas the value of grain increases. Spreading productive assets over a greater geographical area reduces exposure to local drought, but it will be insufficient for a drought in a large region.

Probably the most important factor for improving food security is to keep rangeland and cropland in good condition. A degraded environment will have a low ability to cope with drought. Measures to conserve water and improve water supply and to ensure a sustainable management of rangeland resources will be important for maintaining food security.

Once a drought situation develops, people must resort to other strategies. In the early stages, this includes changes in consumption, such as reducing meat consumption and the number of meals eaten per day. Other early strategies are the sale of animals and labor, migration of some household members, loans, the sale of fuelwood, and remittances from relatives living outside the village. Changing cultivation toward more drought-resistant crops may also be attempted. As the situation becomes worse, there is also an increasing use of wild plants that are not normally harvested in good years.

Early strategies generally have a higher level of reversibility, whereas late strategies are less reversible, often imply-

ing a liquidation of productive assets. Late strategies include the sale of assets such as draft animals, seeds, cattle, and land. After all assets are sold or abandoned, the only remaining solution may be distress migration or reliance on food aid.

In livestock production as well as in rainfed agriculture the revenue risk is high. Most of the variability of revenue is accounted for by yield or production risk, not price and market risks. This is even more so if production is basically for subsistence consumption. In a situation where yield risk not price risk is of concern, the central government will achieve little by policies to stabilize prices.

In local markets, yield risks and price risks are likely to be negatively correlated (Binswanger 1986:324). In a drought situation, however, prices of assets such as livestock and jewelry may be positively correlated with production—many pastoralists will offer livestock at local markets and thereby depress prices—while cereal prices rise (Holtzman and Kulibaba 1993). The terms of trade between products that the livestock owners sell and the goods they buy worsen and the real income of livestock producers declines. In times of good rainfall, the livestock owners, on the other hand, gain relatively more; livestock herds grow fast, market opportunities increase, and local grain prices become lower. This has implications for how farmers and herders build risk aversion strategies, as well as for policies and "good practice" aimed at reducing the consequences of drought. If local price variability can be reduced by making markets more open—through removing trade restrictions, for example, through improving price and market information to producers and traders, or through improvements in infrastructure—then this might reduce the social consequences of drought.

Risk and uncertainty at household level must be met by a variety of measures and institutions—in part as individual solutions, in part as collective solutions at various levels of social organization. For agro-pastoralists and cultivators, the storage of grain is often a preferred local risk aversion strategy (Blowfield and Donaldson 1994). Storing of grain is a traditional and important risk aversion strategy among farmers and pastoralists of the Sahel. Granary stores as a type of self-insurance require a certain surplus production or wealth (Fowler and Moorehead 1992). It is often a complicated and costly means of insurance, as it must be managed in relation to fluctuation of not only grain prices but also the prices of livestock, livestock produce (milk), or other needs of the household.

7.1 Risk, Wealth, and Social Differentiation

Cultivators, agro-pastoralists, and pastoralists are all likely to be affected when

the rains fail. The last major drought in the Sahel in 1983–85 represented a major blow to pastoral communities. Surveys among agro-pastoral and pastoral regions 15 years later suggest that some communities had still not recovered from the drought and may have entered an irreversible cycle of impoverishment (Thébaud 1998). In Senegal and Mali, it has been observed that settled and agro-pastoral Fulani groups have become more nomadic in response to the drought (Juul 1996, Vedeld 1997).

The ability to diversify assets is crucial to spreading risks and being able to withstand shocks such as those caused by drought. Poor households have fewer assets that can be diversified. Drought may therefore tend to increase inequality in a society. In a study from West Africa, Carter (1997) found that small differences in land wealth could translate into major differences in effective risk exposure. Among pastoralists, severe droughts may leave poorer households entirely without livestock or other assets. Traditional coping strategies for such households would include seeking employment with more fortunate households. Some NGOs and other donors have, however, implemented projects with the aim of providing destitute households with a small number of livestock as a drought recovery measure, thus counteracting some of the differentiating effects of drought.

7.2 Drought, Cooperation, and Competition

In periods of drought and desiccation, when key resources become depleted or scarce, the interdependence between pastoral and non-pastoral groups often becomes more pronounced. Historic reciprocal relationships can be mobilized between families and groups of different ethnic and cultural origin. But drought can also lead to more competition and conflict over access to land and key natural resources. While pastoral people once dominated key resource systems, labor, and trade in the Sahelian savanna, this is no longer the case. Still, pastoral economies and political organizations are often intimately integrated with and dependent on the crop economies and external politics of central state formations, despite ethnic segmentation. While the relationships to more settled agricultural communities historically were characterized by complementarity (or dominance by the pastoral communities), the relationship today is often more of competition and marginalization of pastoral groups. Both locally and regionally there are increasing cases of tension and resource conflict, even reaching the level of civil war-like conditions.

7.3 Managing Drought at the Macro Level

Droughts frequently have major economy-wide consequences. Thus drought pre-

paredness is required also at the national level. An important component is a plan for providing food security to the whole population. Preparedness is also required, however, to buffer the economic shocks associated with drought. The best means to increase preparedness is to increase the amount and diversity of assets through economic growth. Besides the apparent obstacles to improving growth rates, there are also indications that for the poorest African countries, drought vulnerability might actually increase initially with economic growth. (See Box 7.1.)

7.4 Good Practices in Drought Preparedness

Although drought is a "natural" feature of the drylands, especially the more arid zones, aid projects still tend to treat it as an unusual phenomenon (Shanmugaratnam and others 1992). It is increasingly realized that drought management must be integrated in all project components.

Box 7.1 The impact of drought on sub-Saharan African economies

A review of economy-wide impacts of drought in a sample of African countries (Benson and Clay 1998: viii) concluded that drought shocks have large but highly differentiated economy-wide impacts. The likely frequency, scale, and character of these impacts depend on the interaction between economic structure and resource endowments, as well as on more immediate short-term effects.

Contrary to expectations, relatively more developed economies in Africa may be more vulnerable to drought shocks than least developed and arid countries, in terms of macroeconomic aggregates and rates of recovery. Evidence suggests an "inverted U"–shaped relationship between the level of complexity of an economy and its vulnerability to drought.

Different regions in Africa are experiencing different long-term climatic trends, implying that different regional strategies are required for mitigation and relief of drought. Although the existence of structural adjustment programs can exacerbate adverse economic and social impacts of drought shocks, such programs also provide a framework within which the broader economy-wide impacts may be more effectively contained.

There has typically been little sustained interest in drought mitigation measures on the part of either governments or donors—except in terms of improving food security. There is considerable scope for wider adoption of drought mitigation measures as well as for the incorporation of the risk of drought into economic policies and planning.

In responding to droughts, financial aid for balance-of-payments and budgetary support should have the highest priority in more complex sub-Saharan economies. Large-scale, targeted interventions should be the primary response in simple and conflict-affected economies.

Such an approach should primarily seek to improve local drought management strategies and provide drought recovery assistance (Pratt, Le Gall, and de Haan 1997). A first requirement is to define and understand drought and its ecological and social consequences. Too little effort has been made to design policies that will reduce both the short-term and the long-term impacts of drought. Linking drought preparedness to overall development strategies is fundamental for increasing food security in drought-prone environments. Policies need to see famine prevention, famine recovery, and improved food security under more normal circumstances as integrated elements of a strategy for food security and drought preparedness.

Central to improving drought preparedness is the need to strengthen indigenous coping strategies—and possibly provide new options for risk management. Limitations on the possibilities for "opportunistic" and flexible resource use will reduce the ability to cope with drought. Households and communities need to accumulate assets that they can resort to in times of crisis. Gender awareness is especially important in the context of coping strategies, in order to ensure that both women's and men's strategies are strengthened. Attention should be paid to intra-household negotiation over coping strategies and resource management.

Supporting the development and adoption of resource management practices that will protect and improve the productivity of dryland resources will be important for increasing assets while improving the natural resource base's resilience to drought. A gradual strengthening of women's access to and control over vital resources may contribute to increased food security.

Fluctuation in prices of livestock and grains during drought can be reduced through expanding market size and reducing transaction costs. Improving infrastructure and liberalizing markets may therefore also contribute to price stabilization, as can emergency grain stores managed by government agencies or by communities.

Public efforts to improve drought preparedness should include the development of a set of early warning indicators and a system for monitoring these. The indicators could be used as a guide for when specific actions to reduce the impacts of drought should be carried out —that is, specific indicator levels could be seen as triggers for actions. As a drought develops this is recorded by the indicators, triggering a sequence of actions. The Arid Lands Resources Management Project in Kenya has included such an early warning system, helping government agencies take timely action during drought (Toba 1998).

By making such information widely available, herders and farmers may use early warning indicators and meteorological information in their individual management decisions, improving their preparedness for drought. Improvement of pastoralists' information base is thus an important component of the Environmental Support of Nomads Project in Saudi Arabia. The project makes use of remote sensing for obtaining data (Al-Gain 1998), but simpler methods may also yield valuable information.

CHAPTER 8

Issues in Strategy and Project Development and Implementation

8.1 The World Bank Drylands Portfolio

Helping affected countries to address drought and desertification and achieve sustainable development is a major priority of the World Bank. The Bank has for many years played a central role in drylands management, including control of desertification and land degradation. Through its commitment to the Convention to Combat Desertification, the Bank has agreed to strengthen the integration of appropriate drylands management policies in its projects and country assistance strategies.

To meet such goals, the Bank has embarked on a new Rural Strategy (World Bank 1997) that particularly links poverty and land degradation. Sustainable livelihoods of affected populations, capacity building, and improvement in agricultural techniques and land management are considered central to stem further land degradation. The importance of gender relations and the key roles played by women in development are recognized.

A recent review (Hassan and others 1998) shows that between 1990 and 1998, the World Bank approved financing for 159 projects directed whol-

ly or in part at natural resource degradation in countries with significant areas of dryland. Direct lending totaled the equivalent of about $8.9 billion and leveraged about $9 billion in addition, resulting in a total dryland investment portfolio exceeding $18 billion. Of this total, 54 of the projects were primarily directed at land degradation, with lending of $1.8 billion. A regional breakdown shows that 40 percent of all projects focusing on NRM are in sub-Saharan Africa, 18 percent are in Latin America and the Caribbean, 13 percent in Middle East and North Africa, 13 percent in South Asia, 9 percent in East Asia, and 7 percent in Europe and Central Asia. In addition, the Global Environment Facility will finance deforestation and desertification projects with global benefits. This makes the Bank the largest single financier of drylands investments.

In addition to the investment portfolio, a number of initiatives aimed at drylands management are being carried out. These include the Sahelian Operational Review, the Soil Fertility Initiative in Sub-Sahara Africa, the Desertification Initiative in the Middle East, the Natural Habitats and Ecosystems Management Handbook chapter on drylands management and biodiversity, Mainstreaming Biodiversity, Conservation in Agriculture, work on land quality indicators, and work on land policies. Under the Global Overlays Program, the Bank is preparing a study on land degradation and global environmental change.

These various activities are coordinated and brought together for dissemination through a Bank-wide Drylands Management Program. Its central thrust is to mainstream land degradation concerns in the Bank's development work and country dialogue through more systematic, participatory, and integrated approaches. This will be done through supporting national environmental planning, building local capacities in affected countries, responding with investments based on country assistance strategies, and initiating country-specific nonlending activities such as economic and sector work. Capacity building through training and institutional development plays a central role—at both local and national levels.

The 159 projects analyzed in the Bank investment portfolio review vary in the degree to which they address dryland and natural resources management. Some of them were fully located within dryland areas, while others only to lesser extent touched on these areas. Some included only one drylands management component, while about one-third of the projects dealt primarily with drylands degradation (soil fertility depletion, soil erosion, overuse of land, salinization and waterlogging, low crop yields, loss of biodiversity, and deforestation).

Important features of these World Bank–supported projects include empha-

sis on poverty alleviation, local capacity and knowledge building, participatory approaches, and land tenure. Many of the projects are of an integrated nature aimed at community-based NRM.

There are some clear lessons to be learned from these projects. The most important finding was that negative performance was mainly the result of managerial and coordination factors at the country level. In particular, the degrees of commitment and capacity of the government and the communities concerned were considered essential for overcoming potential problems (Hassan and others 1998:364). This means that problems were mainly context-related and appeared during implementation. They were not necessarily an effect of bad design. Many of the project design weaknesses were addressed in the course of implementation through project modifications, and performance was substantially improved.

Capacity building and institutional development in relevant (government) agencies have been identified as important—also in relation to combating desertification. The World Bank and other donors have been increasingly involved in institution strengthening and in providing assistance for environmental institution development. A review of the World Bank's environmental capacity building portfolio (Margulis and Vetleseter 1997:i) contains some relevant lessons:

The Bank's perception of the vital importance of institutional strengthening has perhaps not been matched by a parallel understanding of the process through which institutional changes take place.

Changing and influencing institutions fundamentally involves changing institutional cultures, the knowledge base, and informal modes of interaction, more than "simple" organizational structures, legal and regulatory frameworks, or office hardware. Such efforts are inevitably slow and gradual, and they are likely to encounter resistance from established interests. The Bank has perhaps allocated large amounts of money in contexts where the real need is for cultural changes. In fact, too much money may be counterproductive to institutional development objectives, since large inflows of resources distort the normal modus operandi *of institutions, making projects implemented under conditions which are not sustainable.*

The challenges to strengthen institutions in the environmental sector are further complicated by the cross-sectoral nature of environmental problems, the lack of knowledge and understanding of the issues which are typically new in the countries, and the fact that

the institutions being strengthened or charged with implementing projects are typically very young, without clearly defined institutional responsibilities.

Effective assistance to institution building requires clear priorities and an understanding that the processes of learning and cultural change take time. The temptation to do too much, too fast, must be resisted. "Blueprint" project solutions are poorly suited to institutional development. Projects have to be tailored to the case-specific institutional structure and history. They also need to be adaptive and flexible, utilizing pilot projects as building blocks. Projects need to be small, but longlasting. Because the objective should be to strengthen overall environmental management, and not only a specific agency in isolation, it is necessary to create partnerships and cooperation between the agency in question and other agencies involved—and with the ultimate beneficiaries. A key element to success is the government's ownership and political support and commitment.

8.2 Coordinated Policy for Addressing Drought and Desertification

In the follow-up of the desertification convention, the Bank has played a proactive and strategic role in policy formulation, country assistance strategies, project lending, coordination, and network creation. Country compliance with the CCD should be reflected in the Country Assistance Strategies and relevant sector work.

The Bank has been and is likely to continue to be the single most important financier of drylands programs. The level of Bank-financed drylands management projects is expected to increase. This may require that the Bank tailor project lending to support the general objectives of the Convention, including support to sustainable policies and practices for drylands management. Priority will be accorded to Africa, since this is where the major desertification issues have arisen and where the impact on poverty is the greatest. The Bank will aim to maintain its position as a major intellectual force in developing new policies and approaches to drylands management. Research and knowledge creation, with the primary focus on Africa, is already being pursued. The comparative advantage of the Bank may be used to disseminate knowledge and to pursue objectives set forth in the convention. Internal learning at the Bank, capacity strengthening, and synthesis and promotion of best available practices are also central processes of a revitalized rural drylands program. Performance measures and incentives for operational staff and managers to deliver on Bank policy, strategy, and business plan output may be developed.

CHAPTER 9

Mainstreaming Drylands Management Activities in World Bank Country Assistance Strategies

The Country Assistance Strategy (CAS) is the World Bank's major instrument for conducting a policy dialogue on development with governments and civil society in developing countries. Through this process, the needs and priorities that shape the use of Bank resources in each country are determined. It is thus an important document, and of importance that drylands management issues are given adequate attention both during preparation and in the CAS itself. Country Assistance Strategies need to reflect drought and desertification concerns and potential benefits of drylands management programs whenever relevant.

Ekbom and Bojö (1997) discuss the mainstreaming of environmental issues in the Bank's CAS framework. They reviewed 21 CASs from the Africa Region and 13 CASs from other regions to assess the degree to which relevant environmental issues are incorporated. They concluded that the Bank's commitment to environmentally sustainable development was not sufficiently well reflected in the Country Assistance Strategies. Most strategies treated environment as a sector, while some (the best) regarded the environment as a concern relevant to all sectors and aspects of society—and had thus in-

tegrated this concern in all sections of the strategy document. Environmental issues had especially been incorporated into the sections on problem assessment, proposals for Bank actions, the utilization of NEAPs, and partial discussion of the links between environment and sectoral policies.

Still, Ekbom and Bojö (1997) found considerable scope for improvement—even within the constrained format of the CAS. Improvements could especially be made in the analysis of the links between environment and poverty, environment and health, and economic policies and the environment. Environmental issues were also frequently found to be missing in the section for the Board agenda. The CAS process was frequently not well reflected in the document itself.

The authors pointed to the following challenges in the efforts to mainstream environmental issues in CAS processes:

- Improving the integration between macroeconomic policies and the environment
- Translating the transboundary environmental problems into the national frameworks, in policy analysis as well as policy formulation
- Broadening the CAS process to include a wider range of stakeholders.

The present study reviewed three recent CASs to assess how they treat issues related to drylands degradation. To what extent do they represent improvements relative to the general picture found by Ekbom and Bojö? All three selected CASs are from outside the Africa region.

The CAS for Argentina (Report No. 16505-AR, April 24, 1997) contains a section on environmental issues in the chapter describing economic and social performance. The assessment is made that "Within the country, Argentina does not suffer from the acute environmental problems found in many other developing countries." Nevertheless, among the major environmental problems mentioned in the section are land degradation issues of declining fertility, soil loss due to water and wind erosion "that threaten sustained agricultural development in some areas," and drainage and salinization in irrigated areas. The section points to a complex array of institutions with responsibilities for dealing with environmental issues, lack of capacity, and weakness of legal framework as factors that have hampered the solutions to environmental problems.

The CAS will focus on supporting government efforts to, among other things, "improve on the performance and institutional capacity of government, particularly subnational governments, to deliver key social, infrastructure, and environmental services,...and enhance governance through institution building." Environmental issues will, however, also be addressed at the sectoral level through improved environmental sector organizational arrangements and through the development

of an environmental action plan. Although environmental issues—including land degradation—are not given much attention in the CAS, the issues have been mainstreamed into the various sectoral concerns, as well as been treated as a separate sector. Planned Bank activities—both lending and nonlending activities—will include activities aimed at addressing environmental concerns.

The CAS for Khazakhstan (Report No. 16989 KZ, July 31, 1997) describes a number of environmental problems facing the country. Prominent among these are the desiccation of the Aral Sea and severe pollution problems in many areas, not least in the former nuclear testing sites in Semipalatinsk. The environmental problems are extensive and severe, affecting the health and welfare of the population, and influencing the economy's productivity —especially in agriculture. The National Environmental Action Plan thus concentrates on:

- An improved legal and regulatory framework for environmental management, with reference mainly to oil, gas, power, mining, and infrastructure
- A strategy for cleaning up existing environmental problems
- A stronger institutional capacity to enforce environmental standards.

Environmental issues are also reflected in the Bank assistance portfolio. This includes projects dealing with enhanced irrigation efficiency for increasing the water flow to the Aral Sea, as well as various nonlending activities aimed at capacity building.

Among strategies for the agricultural sector, the CAS gives high priority to land reform measures—especially to putting in place laws and regulations on registration of property rights and real estate transactions. Priority is also given to the creation of an administrative structure for land registration. These measures, it is hoped, will create growth in the land market and improve the utilization of land resources.

The CAS for China (Report No. 16321-CHA, February 25, 1997) points to increasing environmental problems, primarily related to urban and industrial pollution. Land degradation issues are, however, also addressed, along with the need to develop and promote sustainable techniques to upgrade marginal land. Investment in water transfer, storage, and irrigation is listed in the program matrix. The progress benchmark for this activity is given as "reduced water and fertilizer use per hectare in grain production in northern China." A more appropriate progress indicator might, however, be "reduced water and fertilizer use per unit of *output*," as this would better reflect desirable changes in resource use efficiency. Reducing input use per hectare seems to be a recipe for a more extensive agriculture, whereas reduced input use per unit of output is commensurate with increased yields and increased intensity of production.

Generally the CAS is very brief in its discussion on environmental challenges facing China, and in describing proposed actions for dealing with the challenges. Even though the format of the CAS places strong limitations on how extensive the discussion of any issue can be, it would seem that the space accorded to environmental issues—given their potentially major long-term impacts on welfare and growth prospects—is too little compared with the space accorded to short-term issues. The CAS emphasizes that a move of lending toward the interior provinces, away from the coast, has been a positive feature in Bank lending to China, and that this trend should be continued.

Judging from the three CASs reviewed, mainstreaming of environmental issues is generally reasonably well implemented, in that they are integrated in all sections of the document. Did they accord environmental issues the place they deserve? None of them focused primarily on environmental and resource issues—but then that does not seem to be called for either. Even in a country such as Kazakhstan, with its grave environmental threats, there are other issues that might be even more threatening in the short term to the welfare of the population—such as the collapse of the agricultural sector due to market disruption following the demise of the Soviet Union.

It is notable that desertification—or dryland degradation— is not given particular attention in the CASs, even though these must be considered as issues that should be of concern in large parts of all three countries. The CASs minimally address drylands management. Dryland issues are treated as an unspecified subset of environmental issues. The CASs are also silent about the impact of natural resource management on economic growth possibilities. Notable in all three CASs reviewed is that the appendix tables give no information about environmental or natural resource indicators. One obvious reason may be that such indicators are still poorly developed.

9.1 Strategic International Alliances, Partnership, and Outreach

Sustainable ways of addressing drought and desertification require active coordination and strategic partnership. The Bank's financial and leadership position in addressing desertification involves a responsibility to reach out and develop partnerships with local and international NGOs, bilateral donors, governments, and professional institutions and international organizations dealing with desertification.

Effective partnership, however, can only be built at the national level, involving affected populations and their representatives (NGOs and community-based organizations), the local and central

government, and research organizations. As noted in the Convention to Combat Desertification, the purpose of such partnerships is to develop action-oriented consensus among all stakeholders on how to tackle issues of drought and desertification in National Action Plans (without new external funding).

Partnership is essential, whether to increase awareness, to develop knowledge, or to coordinate and improve action. Building partnerships is seen as an opportunity for the Bank to broaden its contacts and support in civil society and gain more acceptance by governments of the North and the South for its long-term strategic efforts to mitigate effects of drought and desertification.

9.2 Particular Problems with Design or the Quality at Entry of Dryland Projects

A recent review of World Bank NRM projects presents a list of features of good quality at entry of projects. According to the review (Redwood III, Robelus, and Vetleseter 1998), project good quality at entry is now generally understood to include:

- Strong borrower "ownership" of project objectives and components, particularly those involving critical policy, institutional, and/or financial reforms
- Active stakeholder participation in project design and implementation
- Clarity of project objectives and component description (and clear logical connections between the two)
- Effective incorporation of lessons learned from previous projects in the same country and with similar objectives and designs
- Identification of critical risks
- Adequate project preparation prior to Board presentation
- Careful implementation (and supervision) planning, including specification of key performance indicators
- Realistic assessment of borrower institutional capacity for project implementation
- Avoidance of excessively ambitious objectives and/or overly complex project design (relative to actual borrower commitment and implementation capacity), such as in terms of the number of components, executing agencies, cofinanciers, or implementation arrangements.

In addition to these general features, the reviewers list a number of other good quality at entry elements of particular relevance to NRM operations:

- Using social assessment to identify—and begin to involve in project preparation and implementation—key local stakeholders, as well as potential conflicts over alternative patterns of resource use
- Analysis of the property rights regime in the project area

- Careful analysis of the incentives to resource users to adopt the "environmentally friendly" or conservation-oriented management practices that are being promoted
- Obtaining an understanding of the basic ecosystem functions and services associated with the particular resources involved, to help ensure that the proposed project leads to a more sustainable use of the natural resource base in question
- When there is limited understanding about ecosystem behavior and environmental variables critical to sustained resource use, long-term applied research on ecosystem functions and dynamics
- In situations of uncertainty, piloting of approaches to test their local acceptability and implementability and to learn from experience before applying them on a broader scale
- Ensuring that project approaches and technologies are replicable in other settings (Is the project likely to demonstrate new technologies and change perceptions and motivations of resource users and government officials?)
- Provisions for careful monitoring and evaluation of project outcomes in terms of actual economic, social, and ecological costs, benefits, and implications for sustainable resource use on the underlying ecosystems and affected communities.

With some exceptions among the more recent projects, the reviewers found that these elements were largely absent in many of the NRM project cases examined. Toba (1998) found the following in a review of World Bank–supported projects involving drylands during fiscal years 1990 to 1998:

- Many of the projects, involving important land use changes, were designed with little understanding of the socio-economic and institutional conditions of the local population and the dynamics and sustainability of changes in land use. Historical analysis of formal and informal institutions, socio-economic issues, natural resource use practices, and landscape changes were rarely conducted.
- Most of the projects focused on rehabilitation of degraded natural resources rather than on measures to prevent degradation.
- Drought and climate change preparedness (including early warning systems) were addressed in only a few projects, and among these drought was often treated as a contingency, not as an inherent feature of drylands.
- The potential effects of land use change or land productivity change related to physical parameters were rarely addressed in the appraisal reports, nor were they a concern of monitoring and evaluation.

- Very little economic assessment of land quality (soil fertility, for instance) and its change, including "with and without project analysis," was conducted in the projects.
- Resource conflict management was explicitly addressed in only a few projects, although resource conflict is a common feature in many dryland areas due to diverse interest groups, complex and often overlapping property rights systems, and weak national integration.
- Problems of migration and environmental refugees were rarely addressed in the projects, even if these are increasing problems.

There are obviously limits as to how much of a project budget can be used for preproject studies and research, but the large scientific uncertainty and disagreements that surround drylands ecology and management indicate that these issues need considerable attention in project design. Involving local populations at an early stage can be of great help in understanding the systems. These people do, after all, have a tremendous store of knowledge on the systems—as proved by their ability to survive in these harsh environments.

CHAPTER 10

Conclusion

The understanding of "desertification" has undergone major changes over the last two decades. The problem is now seen more as one of reduction in land productivity in the drylands rather than of productive land turning into deserts. Deserts do expand and contract, but primarily depending on rainfall variation. Environmental change does take place in drylands. Some changes would be called "degradation" by most observers, but many of them may have different individual interpretations of "environmental degradation" and "environmental improvement." Perceptions will depend on personal values and on what types of landscape an individual appreciates.

Closer studies of long-term landscape changes, of rangeland ecology, of community natural resource management regimes, and of agricultural intensification processes reveal many cases where the resource management practices adopted by the people living in an area have unjustly been seen as degrading the land. Thus, overgrazing has probably been exaggerated as a problem, especially in the driest areas. Much is still unknown, however, about how dryland ecosystems are affected by different resource management practices.

There is a need to understand drylands change and management in a local and site-specific context. There is a heterogeneity or variety of causes and consequences of environmental change. Consequences of a certain type of change will differ from one social and ecological setting to another. Major differences exist in land availability and access, rainfall, access to irrigation water, forest cover, livestock numbers and dependence, and soil type. These differences affect agricultural development potentials, extension and research strategies, and natural resources management. Each country and region requires a different strategy. It is important that donor strategies are more selective as to what countries to assist as well as what areas and communities to target.

A main lesson of the past, emphasized in this paper, is that strategies to improve drylands management must build on a greater appreciation of the skills with which drylands people allocate resources and use opportunities, and of the constraints they face. Interventions by governments and donors must utilize the knowledge of local people, and be based on their views of what is appropriate.

The Convention to Combat Desertification calls for the development of National Action Plans to Combat Desertification. The NAPs are supposed to integrate environmental concerns into country economic planning and social development. The plans are to be developed through participatory processes involving public and private organizations and people at large. But resource management itself has to be more participatory. Indeed, local communities should have more responsibility for resource management.

Devolving power to local communities is, however, not free from problems. Creating "bottom-up" processes from "top-down" initiatives is difficult. Communities are usually heterogeneous groups, prone to be dominated by local elites. If devolution is achieved through the delineation of a piece of landscape that is to be managed by a community, disputes may arise between communities over border issues or shared resources. More specifically, there is a danger that the delineation will be used to shut out pastoralists from important dry-season pasture. Projects to strengthen local institutions are often considered too slow, too costly, and too complex—thus limiting the number of communities that can be reached.

Drought preparedness should be a primary concern. Too little effort has been made to design policies that will reduce both the short- and long-term impacts of drought. Linking drought preparedness to overall development strategies is fundamental for increasing food security in drought-prone environments. Policies need to see famine prevention, famine recovery, and reducing food insecurity

under more normal circumstances as integrated elements of a long-term strategy for food security and drought preparedness. The risk and uncertainty created by drought must be met by a variety of measures—as individual solutions and as collective solutions at various levels of social organization. Public policies should seek to strengthen the effectiveness of drought preparedness strategies already adopted by rural households—and if possible seek to provide new opportunities for coping with drought.

Efforts to reduce dryland degradation require intensification in agriculture, translated as more efficient use of land, labor, and capital, related to technological, institutional and policy innovations. Inadequate, highly variable, and erratic rainfall represents a major constraint to agriculture in the drylands. This paper has, however, pointed to a number of other constraints that may often be even more binding, such as infertile soils, remoteness from markets, poorly functioning markets, and—last but not least—inappropriate policies. It has presented a number of technological possibilities for improved land conservation and productivity increase, such as water harvesting, soil conservation, and the use of organic and inorganic fertilizers. However, technologies do need to be adjusted and adapted to local conditions. In particular, they need to be appropriate to the resource constraints farmers face. Therefore research needs to be participatory.

In a review of agricultural experience up until the mid-1980s, Cleaver (1997:10) concludes that "the public sector-managed agricultural and rural development projects widely supported by African governments and intellectuals, the Western academic community, and donors, were fatally flawed in design and execution. This was partly due to factors external to the projects themselves (poor government policy, international prices, climatic constraints, and institutional weakness) and partly due to fundamental design flaws." He suggested a new strategy that is also appropriate to drylands. (See Box 10.1.)

The basic preconditions for improved drylands management are government concern, political will, and commitment. It is not always obvious that these exist. Focusing more attention on how government commitment is created and sustained—the political economy of drylands management—is therefore important.

Drylands management has to a large extent been seen as a defensive battle: a struggle to protect and conserve dryland resources from degradation—a combat against desertification. Although there are environmental resource problems threatening the livelihood security of people in large parts of the world's drylands, there should perhaps be more focus on possibilities, not just on problems. Pointing to

Box 10.1 Elements of a strategy for rural development

(***Italics indicate change of emphasis from earlier strategies***)

National agricultural extension *with participation by farmers, NGOs, and the private sector and with closer attention to fiscal sustainability.*

National agricultural research *with better links to farmers' needs at one end and to international research at the other.*

Agricultural policy reform and institution building *with more focus on land tenure, decentralization of the public administration, overcoming of constraints on rural women's participation, and reform of the legal system.*

Farmer-managed small-scale irrigation.

Expansion of natural resource management programs with *more farmer and community management*; support for national water, forestry, and soil fertility programs.

Support to farmers' groups to mobilize participation by farmers and especially by women's groups in project preparation and implementation.

Direct support for private-sector marketing and processing by equity investment arms like IFC and MIGA.

Agricultural and rural credit through rural-based *private and cooperative-owned banks that mobilize savings, use market-determined interest rates, and undertake serious loan recovery efforts.*

Expansion of national health, education, population, and nutrition programs that include services to the rural population, *and a focus on primary services.*

Development of infrastructure in national water supply, rural roads, and transport programs, each serving rural areas *with participation by the private sector.*

Use of extension, farmers' groups, credit, social services, and policy reform to deal with women's issues.

Safety net for the poorest.

Capacity-building efforts in all projects and programs.

Source: Cleaver 1997:31.

potentials and possibilities may create more enthusiasm for the task at hand. This paper has pointed to many possibilities for increasing the productivity of drylands. A doubling or fourfold increase or more of yields should be well within reach in many areas. To be sure, many obstacles and constraints first need to be passed or removed. Many dryland areas have a rich history. If appropriate actions are taken, they may yet provide well for their inhabitants.

Notes

1. Scoones (1995) compares the productivity of pastoral production systems in nine different African countries with ranching systems under similar conditions—Botswana, Ethiopia, Kenya, Mali, Mozambique, South Africa, Tanzania, Uganda, and Zimbabwe—arguing that the productivity of the pastoral systems in most cases far exceeds those of ranching. He lists close to 30 pastoral studies that compare production per hectare, output values, and economic returns per hectare.
2. Four questions might be raised in relation to the holistic approach: Does it address a real problem (overgrazing)? Is rotational grazing appropriate for improved or more efficient range management in pastoral Sahel? Is it well adapted to the institutional context—that is, related to local knowledge and tenure systems and the capacity of national institutions? Given the problems suggested, is it financially viable and economically sustainable as a government/donor approach? These are questions the project is seeking to answer.
3. De Haan (1994) mentions Chad and Mauritania and limited pastoral components in Kenya and Mali.

4. There are clear differences between livestock species with regard to susceptibility to drought. Thus during the drought that hit the Sahel in the early 1970s, mortality rates for cows, small ruminants, and camels were 30 percent, 12 percent, and 8 percent respectively (Penning de Vries and Djitèye 1982). Investing in browsers like goats and camels is safe even in drylands, but cattle might provide better income when drought does not occur.

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