

Lessons Learned from IDRC-Supported Research Projects on Desertification and Land Degradation

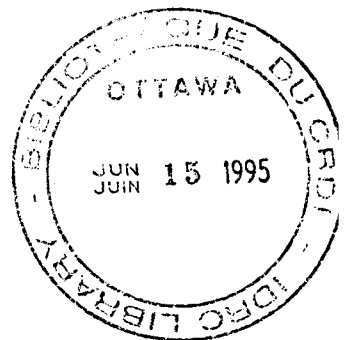
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TABLE OF CONTENTS

Introduction	...1
Lessons Learned: Research Methodologies	...6
Lessons Learned: Research Issues	...17
Lessons Learned: Dissemination and Utilization	...32
Conclusion	...37
Annex 1: <i>Recommendations of the Workshop on the "Impact of Indigenous Knowledge and Traditional Coping Strategies on the Prevention or Mitigation of Land Degradation and the Desertification Process in Africa", Cairo, 1994.</i>	...44
Annex 2: <i>Recommendations of the Workshop on the "Impact of Natural Resources Ownership Patterns, Tenure and Access on Land Degradation and the Desertification Process in Africa", Dakar, 1994.</i>	...47
Annex 3: <i>Recommendations of the Workshop on the "Impact of Trade, Structural Adjustments and Economic Policies on Desertification in Africa", Nairobi, 1994.</i>	...49
References and Resource Bibliography	...51

INTRODUCTION

The International Development Research Centre (Canada) or IDRC has been funding research in developing countries on the subject of desertification for over twenty years. During that time, the approach to research, the priority research issues, and the utilization and dissemination of research results have changed significantly as key lessons have been learned and applied. In other words, we have learned lessons about *how to do research*, *what to research*, and *what to do with the results*. This paper serves to outline the lessons learned in these three areas, using IDRC project material as illustration, while highlighting issues that require further research. The focus will be on Africa, even though desertification occurs all over the world.

A small but representative literature review was conducted in preparation for this paper (see bibliography for references). Several introductory points emerging from the literature follow; other points are incorporated into relevant sections of the main body of the paper. The three general areas mentioned above serve as the main sections of the paper.

Desertification

Desertification is an elusive and controversial concept. The term describes an ecological fact, that of land degradation in dryland regions of the world, but it is as a human environmental issue that it becomes of particular concern for governments, scientists and the activist and donor communities. Land degradation has been a reality for millions of people living for thousands of years in the drylands; these people have developed entire social systems around this reality. The accelerated rate of social and technological change over the last century, however, has created tragic situations where people find it increasingly difficult or even impossible to survive in these regions, since land degradation has become so severe. It is the human concern which has motivated the discussion about desertification over the past twenty years in particular and led so many countries of the world to the signing of the International Convention on Desertification in October, 1994.

The myth of rapidly and persistently advancing deserts or desert encroachment has been debunked in many circles - though not all - but the well-publicized debate over the definition of desertification (are climate or people primarily at fault?) will undoubtedly continue for years; all conclusions from geographic monitoring systems point out that the relationships among climate change, climate variability and desertification are largely still poorly understood and will be for many years. The United Nations Conference on Environment and Development (UNCED) in 1992 proposed a "compromise" definition: "Desertification is land degradation in arid, semi-arid and dry sub-humid areas

resulting from various factors, including climatic variations and human activities." (Agenda 21, Chapter 12) This broad and therefore imprecise definition has been picked up in most recent literature on the subject, but it is often coupled with a remark about its ineffectiveness as a diagnostic tool. The paper will not attempt to outline the symptoms or extent of desertification nor its many causes and effects, except as these become relevant in the following sections. For general information about desertification, the reader may refer to several recent assessments of desertification (see: Cardy, 1993; Dregne, 1991; Hellden, 1991; Jones, 1993; Odingo, 1990; Thomas, 1993).

Land degradation

Land degradation is itself defined in human (economic) terms as a progressive "weakening [of] the physical, biological and economic potential of the land, thereby severely reducing or curtailing overall productivity." (Odingo, 1990, 47) Human activity is of course the primary point of departure for farmers, activists, researchers or donors to halt or reverse land degradation and the subsequent desertification process. This emphasis on human activity, without denying the role of climate and other physical factors, can take us away from the theoretical discussion over definitions to focus upon what is actually being learned in the field as people struggle with a very real and immediate threat to their survival. It also sheds light on a crucial point: concepts such as "sustainability" or "equilibrium" are themselves only relevant in these discussions when examined from the particular context of the people and their activity in a specific locale. What is a sustainable environment for one people may be unsustainable for another - their definitions of sustainable are different and/or what they want from their environment is different. Even within communities or families, perceptions of sustainable management systems can differ and even conflict. The management of dryland resources, in fact of all natural resources, is therefore highly context-specific over time and space.

Resilience

"Resilience", the ability to adapt to change - and not necessarily to stay in equilibrium - is receiving credence as a more useful concept in discussion of dryland management; both natural ecosystems and human communities can be viewed in light of their resilience to environmental change. Even a cursory look at communities living in the drylands indicates a range of coping or adaptive strategies used on a regular basis by the people living in the highly volatile environment of arid, semi-arid and sub-humid lands. The combination of these strategies together makes up what one could call a strategy for resilience. The literature on desertification, and consequently government and donor activity, have only taken serious notice of these strategies in recent years. The failure of many efforts over many years to halt or reverse

desertification is agreed upon throughout the literature, despite the diverging political interests of the authors. Most also agree that these failures were due primarily to the lack of participation of local people in all aspects of a project, the lack of consideration of traditional knowledge and coping strategies and the further weakening of local institutions and structures by these very same projects.

Local participation

It was once assumed that land degradation and desertification could be solved by the transfer of technology, such as large-scale irrigation, and the application of national or regional policies, such as settlement of pastoralists. Time and experience have demonstrated that the classic top-down approach which developed and imposed inappropriate policy and imported inappropriate technology was not only a waste of resources, but also served in many cases to exacerbate the situation of the people living in affected areas. The literature indicates a consensus that appropriate technology and policy are vital and must be developed with participation of local people, who find a technology or policy "appropriate" based upon a context-specific combination of factors, in which socio-economic, gender and cultural factors are key. (It is over the operationalization of participation that divergent views become evident. Participation is a nebulous term which can be defined to suit any number of political agendas - and has been.)

The fact that local people no longer have the means to manage their resource base sustainably (due to increasing poverty, defined as both a lack of resources and a lack of influence on decision-making) has facilitated the desertification process; an IDRC staff member, among others, has been quoted as saying that "the war against desertification will be won or lost at the local level". (Krugmann, 1994b, 1) Having said this, there is little experience in most circles with how to translate the implications of such a statement into action in specific local contexts. The lessons IDRC has learned about desertification from its projects over the years are all extracted and framed from within this understanding.

IDRC-supported research

Over the last 24 years, IDRC has supported hundreds of projects in Africa which have researched, directly or indirectly, solutions to problems of land degradation and desertification. The projects selected for illustration in this paper will be taken primarily from a review of 56 desertification-related projects, a review in three volumes which summarizes projects and their findings in Eastern and Southern Africa, West Africa, and the Middle East and North Africa. (IDRC, 1993a, b, c) The review includes only "projects which

examine aspects or processes of desertification in fragile arid or semi-arid ecosystems and/or seek to develop approaches or interventions (technical and/or socio-economic) of direct relevance to the desertification problematique in Africa." (Krugmann, 1994a, 1) The themes or issues explored by these research projects are outlined below as background for the reader:

- Components of dryland systems (soil, water, woodlands, populations), their characterization, survey and analysis, and the development of techniques, methods and tools for the rehabilitation or improved use and management of such components. This category includes projects on: afforestation methods; increasing soil fertility through tree planting and management; soil and water management; and techniques of mapping vegetation or population distribution and interactions using Geographic Information Systems (GIS) or remote sensing.
- Specific methods and techniques for the control of erosion and desertification. This category includes projects on: shelterbelts; irrigation; water harvesting; rangeland management; and land reclamation.
- Agricultural, forest, pastoral, and mixed production systems and methods to increase their productivity and/or sustainability. This category includes projects on: assessment and development of dryland farming systems (irrigated or not); development of drought-resistant crops; agroforestry systems and methods; livestock productivity improvement; and pasture improvement.
- Social, institutional, cultural, demographic and political aspects of dryland resource use and management. This category includes projects on: displacement, migration, and resettlement; resource tenure practices and policy; social organization and differentiation; common property institutions; and adaptive strategies and alternative livelihoods.
- Information and dissemination systems on issues related to desertification. This category includes projects on: development of national or regional data and information bases; related institutional support; and related infrastructure development.

Of course, these categories (adapted from Ibid. 1-2) are not mutually exclusive (nor exhaustive). There are significant overlaps and some projects may fall

into more than one category. For a time, IDRC also funded a number of anti-desertification projects related to energy use (such as the improvement of woodstoves). As analyses of the wood energy "crisis", as it was known, evolved and the applied solutions did little to meet the needs of the people, IDRC moved away from direct support to this type of effort.

Paper outline

The lessons IDRC has learned from these and other projects are many, and I will examine only a selection of them. I will explore first some lessons learned about research approaches and methodologies. Research issues/gaps will follow, preceding the section about utilization and dissemination. At times, these areas will overlap with each other (eg. there is a need for research about research methodologies). The lessons learned come from both successes and failures (however defined) and evidently are informed by the experience of other organizations as outlined in the literature and expressed in meetings and workshops. In outlining specific project objectives, their successes and failures, I will often take directly from the three-volume review mentioned above, without formally quoting it. Recommendations about specific thematic issues in desertification can be found in the three annexes at the end of the paper; these are taken from the conclusions to three workshops sponsored by IDRC in preparation for the final negotiating sessions in 1994 around the International Convention on Desertification.

LESSONS LEARNED: RESEARCH METHODOLOGIES

Multisectoral research

Much of what IDRC has learned about "how to do research" through its experience with desertification projects parallels lessons learned in other areas in which IDRC is active. There is a trend in the more recent IDRC-supported projects towards integrated projects: projects which are both multi-sectoral and multi-disciplinary. The World Bank itself, in a Drylands Management Study, states that: "Typically, development projects have focussed on specific sectors: either farming or forestry or livestock, without realizing that rural populations have historically operated on the basis of some combination of these aspects." (Seve, 1990, 5) IDRC's early projects on desertification were no different; the focus was upon particular ecosystem components and the research concentrated on technical solutions. The development of specific biophysical barriers to desertification and the rehabilitation of degraded ecosystem components were of greatest concern. These early projects included afforestation through community woodlots, establishment of shelterbelts and water harvesting methods for conservation.

A typical such project is an afforestation project supported in Jordan from 1975-81 (75-1020-00)*. The objectives of the project were: to undertake silvicultural studies to improve afforestation methods on severely eroded and biologically degraded land; to evaluate the tree-growing potential of selected sites in the arid zone utilizing rainfall-runoff collection plots; and to train local staff in experimental methods for forest research. Several local researchers were trained and experiments did show that certain species like *Eucalyptus camaldulensis* can survive and grow in desert wadis with a low level of protection. The project suffered from technical, administrative and financial problems which impeded a greater success for the project; nonetheless, the single-sector, non-participatory approach to the research contrasts greatly with many IDRC projects in the 1980s and 90s.

Around 1980, IDRC began supporting research which recognized the interactions between ecosystem and production system components and sectors, such as between soil and trees or between crops and livestock. Support for agroforestry research was one excellent example of this trend.

* Project examples include IDRC file numbers for reference. The first two numbers indicate the year the project began.

A three-phase project beginning in 1980 and ending in 1990 (79-0120, 83-0097, 85-0193) in the desert areas of Egypt serves as a good example of multi-sectoral research. The project "Desert Farming Systems" had as an overall objective to improve the productivity of the virgin desert sandy soils and to develop suitable desert farming systems. Phase I concentrated on improving the production of sandy soils by applied research in forestry (windbreak and multipurpose trees), crops (green manure) and animal husbandry. In Phase II, water management experiments were begun. Phase III emphasized the dissemination of results to farmers.

Multidisciplinary research

A large portion of the recent literature on desertification emphasizes "that problems of desertification and land degradation in dryland regions are largely the result of socio-economic factors and policies and, hence, their solution must be found also largely in this domain." (Toulmin, 1993, 28) Put another way: "C'est seulement en analysant à la fois la dégradation physique et la dégradation des relations sociales de production que nous pourrions cerner tout le processus de la désertification." (Ngaido, 1994, 5) Alongside the movement towards multi-sectoral research, and particularly in recent years, there has been a concerted effort to support projects which combine biophysical and technical issues with socio-economic, institutional and cultural issues. This is not to say that IDRC has not always supported research on the latter aspects, but that often such research was divorced from the technical aspects.

For example, a project on "Resettlement of Displaced Populations in the Commune of Tombouctou, Mali" (88-0346) wished to: help restructure rural displaced communities; encourage food self-sufficiency; define nomad resettlement policy more explicitly; and define the anti-desertification work in clearer and more realistic terms. The project was very successful in collecting useful socio-economic data on a number of fronts and broadening understanding of the settlement process for nomads. Unfortunately, environmental factors were not taken into account; techniques and strategies for resettled nomads to deal with drought and desertification were not integrated into the project and eventually these environmental realities exacerbated ethnic tensions, leading to the dissolution of many of these communities.

The project "Seasonal Hunger and Nutrition (Kenya)" (89-0241) is examining the extent and causes of seasonal hunger among small scale farmers and squatter families. The study includes an analysis of both intra-household food distribution practices and the coping strategies used by different families to cope with seasonal food shortages. The information collected could be instructive in designing drought-coping mechanisms, a strategy relevant to desertification control efforts. It remains to be seen whether this project will successfully integrate the socio-economic data with the biophysical facts and the techniques available to truly enhance desertification control.

In Senegal, the project "Ligneous Fruit Trees" (91-0122) has been exploring the development of superior varieties of two fruit trees with high economic potential. The government's reforestation program (part of an action plan to combat desertification) has moved from large-scale plantations towards village-based plantations of local species and fruit trees. This project is attempting to develop superior varieties of jujube and tamarind - superior for industrial processing and therefore for income generation and diversification for peasants, and superior for traditional uses such as hedges. Socioeconomic studies were conducted from the beginning, indicating which varieties were most popular, how the species were harvested, who has access in what circumstances and where planting should be done. Seed germination techniques and methods to grow seedlings in nurseries and plantations are also being perfected. The expectations for this project are high. The integration of the biophysical, technical and socio-economic factors indicate very promising results.

A project in Jordan, "Water Harvesting" (92-1502) has as its objective the development of an integrated model of sustainable water harvesting and management strategies for entire watersheds in arid and semi-arid regions. This project is multi-sectoral, multi-disciplinary and incorporates biophysical, technical and socio-economic aspects. The specific objectives include: to collect, organize and analyze soil, water and socio-economic data from the watershed for input into different model components; to develop the components in a micro-computer based software and integrate them into one model; to organize the collected information into a Geographic Information System (GIS) and to interface the model with the GIS; to disseminate project results as related to model capability, limitations, application and utilization; and to strengthen Jordanian institutional capability in hydrological modelling and GIS.

Research methodologies

These last two projects also illustrate IDRC's move towards the support of multi-disciplinary research methodologies - that is, support has been extended to include not only research which itself examines technical as well as socio-economic and other issues, but also research projects which recognize and apply the implications of such thinking to the actual methodology. Many IDRC-supported research teams now include natural scientists working alongside social scientists and research methodologies have become correspondingly complex. A diversity of research methods, including quantitative and qualitative methodologies, are now commonly found in one project. This has meant a shift in the way in which IDRC staff are expected to evaluate potential and ongoing projects; it has also meant that projects must often juggle and accommodate several components and staff of very different backgrounds. The process is a learning one for both IDRC-supported project teams and IDRC staff, as people increasingly work in multi-disciplinary teams.

Local participation

The key question of participation of targeted users and beneficiaries adds to the growing complexity of IDRC-supported projects. There are several examples of IDRC projects which have fallen short of their objectives, due in large part to the lack of full participation by beneficiaries.

A project in Zambia, "Dry Forest Management" (86-0093) serves as one example within IDRC's projects of the sometimes dramatic results of inadequate participation by local people. The objective of the project was to develop methods for management and regeneration of the Zambezi teak forests of Southern Africa, specifically to develop in-situ and ex-situ methods. Management Resource Areas (MRA) were to be demarcated for field research in consultation with local people. The project did generate technical information which has proved useful; however, local people were not genuinely involved and it is suspected that two MRAs were deliberately burned by the people in those areas. (This was never proven, but it was taken as indicative that the people did not attempt to stop the fire).

Everyone has different conceptions of what participation really means in practice. The project described below began over ten years ago and is now in its third and final phase. It is an excellent example of mixed outcomes in relation to participation and shows the learning process which the researchers and IDRC went through.

The "Dryland Agroforestry Project (Kenya)" (87-0114) has had a number of successful outputs. It was designed to develop appropriate agroforestry systems in the semi-arid areas of Kenya, and specifically to screen multipurpose trees for use in alley-cropping and on grazing lands, and to disseminate the research results and thereby improve the quality of life of resource-poor farmers. The researchers did succeed in: developing low input dryland technology packages for increasing soil fertility; slightly improving the grazing lands; developing soil conservation techniques and water retention ditches that encourage plant growth; and training a number of farmers, teachers and students. The project is considered to have had a relative success in attaining farmer involvement. The methodology of the project included farmer interviews, on-farm research activities and close work with a few farmers and, in recent years, with women's groups and primary schools. Some 200 farmers in the vicinity of the project have planted several drought resistant tree species introduced through the project. However, as one IDRC staff member has written: "This is not the first project or programme, nor will it be the last, to set off on the development track armed with faulty assumptions and pretensions of knowing what people need." (Ayling, in press, 6) A number of the technologies developed, despite being acclaimed as technical and biological breakthroughs, were not adopted by farmers on a widespread basis. It also came to light that the farmers who were more enthusiastic about participating in research trials were those who were better off and did not entirely depend upon farming for their livelihood. It became evident that meaningful success in achieving the stated goal of improving the quality of life for resource-poor farmers could only have been reached by genuine involvement of these farmers beginning with the very design of the project.

Ayling states that the researchers and the farmers in this project had different "points of departure", different social contexts and backgrounds. (in press) Toulmin, of the International Institute for Environment and Development, writes that:

It is now recognized that successful technology development must rely on a more collaborative partnership between local people and outside professionals...[which has] major implications for the kind of research undertaken, methods used, and professional hierarchies. Incentives will be needed to achieve a shift in how professionals perceive themselves, from being "the expert" to promoting reflection, analysis, and experimentation with local people. (1993, 28)

Increasingly, IDRC is supporting research for which local people have a substantial role in setting needs and priorities and in which dissemination of research results is targeted for users in an appropriate fashion (eg. in the local

language). Who actually does research (university-trained scientists or farmers themselves), where (on or off farm) and why, are becoming larger concerns for IDRC. This of course includes greater awareness of the differing roles of women and men and the differing effects of the application of research results to aspects of their lives. Shifting the focus of attention from technology to people (as women, men and children in distinct relationships with each other) is key. The ultimate objective, as defined by Toulmin, is now understood as "the development of endogenous capacity to identify research priorities, and to carry out programmes appropriate to the needs of local people." (Ibid.) This objective is implied or stated in much of the literature about desertification; studies of actual experience in the field indicate that the rhetoric in the literature is not regularly translated into action. IDRC will be funding the following project. It is an excellent example of a project which might well achieve this "translation"; it attempts to meet the "need for local-level action-oriented research to experiment with different mechanisms and modalities on technical and socio-institutional 'interventions', facilitating self-help and providing needed support beyond that." (Koala, 1993, 8)

The "Elangata Wuas Ecosystem Management Programme" in Kenya "was established in 1990 as a joint effort of a local self-help group, the Kenya Wildlife Service and the Centre for Biodiversity of the National Museums of Kenya. The objective is to establish a community-based approach to sustainable management for the programme area...the area may be regarded as semi-arid. The population consists of Maasai pastoralists who, over the past decades, have come to settle...Environmental degradation, manifest through bush encroachment and erosion, has reduced the carrying capacity of the land." The three components of the program are: "to reverse ongoing processes of environmental degradation, as well as [to re-establish] previous levels of biodiversity on degraded land"; to find alternatives for sustainable income generation; to promote community development (through community decision-making, environmental education and ensuring women's equal participation). IDRC will be funding the research aspects of this program. Local people are involved in all stages of project design (in fact, the self-help group was established before the other program partners joined and all plans must be approved by this group); many of them will be trained in various sectors related to sustainable natural resource management. IDRC will be funding the training of local "environmental workers" who will be trained to monitor the local environment. They will receive taxonomic training as well as skills for land degradation assessment. In the end, these people will be able to advise the self-help group when it is making decisions about local natural resource management. (adapted from "An Introduction to the Programme" - unpublished)

At a 1993 IDRC-sponsored workshop about grassroots indicators of sustainable and equitable development (indicators observed and used by local people), a protocol about how to conduct research was suggested. It is indicative of the thinking of many of our Southern partners in research as well as many IDRC staff and is reproduced on the next page.

Local knowledge

Participation of users/beneficiaries raises the issue of the role of local knowledge in research (including the distinct roles of women's and men's knowledge). There is no recent literature which denies the value of hitherto undervalued knowledge of the people who actually live in dryland regions of the world. They have survived and often thrived in difficult environments and climates -- the only wonder is that it has taken so long for governments, donors and the like to recognize that the people must have been doing something right, and that key lessons could be learned from their experience. A World Bank Drylands Management Study points to a "lack of understanding of traditional production systems, which were developed over time through adaptation to difficult climate and soil conditions, and have historically provided stable utilization of limited natural resources" (Seve, 1990, 5) as one of six key reasons for the lack of success in most development efforts in the drylands. The IDRC-supported project which follows after the protocol is an example of a highly participatory project in which the knowledge of the beneficiaries is used to develop a thorough understanding of pastoralists' traditional production systems upon which further action is to be based.

A Draft Protocol for Research and Networking Activities on Grassroots Indicators

1. Research needs and priorities are to be identified by communities.

Community input can shift the focus and goals of research to demonstrate the utility of local knowledge in decision making, to identify useful indicators for sustainable and equitable development, and identify gaps in the reporting system.

2. Research is to be focused on community needs and interests.

Communities are capable of identifying problems, issues, and sources of conflict, and of recognizing early warning signals of un-sustainable and un-equitable development.

3. Research time and resources will be available to address issues of interest to communities.

The interests of the community will not be an add on or an afterthought, nor will groups within the community with which researchers have found difficulty communicating (eg, women, children, the elderly, minorities internal to the community) be shortchanged.

4. Research done in communities is to be done by the communities.

Communities and individuals who are sources of information will be given credit, as will their contributions of time to research. Knowledge based on a long tradition, which has been transmitted by any means, including verbal, will not be presented as "new".

5. Research results are shared with the source individuals, community, or communities, in the local language, before they are shared with the broader public.

The community will have a continuing role in the formulation, presentation, and benefits derived from local knowledge.

(from the Report of the Workshop on Grassroots Indicators of Sustainable and Equitable Development, held October, 1993, IDRC, Ottawa - in press)

The project objectives of "Pastoral Systems of the Maghreb - Morocco" (89-0265 Phase II) were to produce an analysis of the research zone, study the institutional organization, action strategies and economic dynamics in the region and establish methods to improve pastoral output. The interdisciplinary research team conducted a comprehensive study of 148 pastoralists and after numerous visits to the zone, one research team member stayed on with the group of pastoralists under study. The study indicated that past development efforts had frequently been limited to technical considerations with no regard for complex human factors and sociological data and with no effort made to inform the people concerned. The focus had been on improving grazing areas while the real needs of the people were both more diverse and more immediate. They included adequate water supplies, herd health monitoring, credit availability, and improved communications with the outside world. A new phase, initiated in 1991-92, is expected to develop a system where pastoralists and local technicians would jointly monitor experiments and the improvements proposed for the zone. Local people would be responsible for monitoring such factors as vegetation conditions, animal behaviour and weather conditions. These activities would help researchers understand how pastoralists perceive the rangelands ecosystem in relation to their herd management methods. The study would lead to the development of concrete measures to improve pastoralist potential, using pastoralists' knowledge as a base. Pastoralists would be directly involved in the selection of technical options aimed at boosting production and improving fodder resources management.

Site-specificity of research results

The above project is one component of a series of three studies on the Maghreb (Tunisia, Algeria and Morocco). The results of the studies served to highlight similarities among the three countries, but also to reveal significant differences between current conditions in the rangelands. A general conclusion from these studies and other IDRC-supported projects is:

that problems and needs are often very site-specific and variable and that the knowledge and information (including traditional local knowledge and information) required to achieve lasting improvements in local dryland resource management cannot easily be discerned from experience elsewhere in countries or regions [in Africa]. Generalization and replication of research results (and of development experience) -- which elements and aspects can be transferred and in what ways -- is an area that requires a lot of further thought." (Krugmann, 1994a, 3)

Long-term support to research

The World Bank study mentioned previously also points to a common lack of "commitment to a long-term process...in project design", contributing in many

cases to the unsustainability of programs and processes developed through projects. (Seve, 1993, 5) IDRC, as a rather small funder of research, has found that this problem can be dealt with in part by the development of long-term relationships with targeted institutions, i.e. support is extended for a series of related projects conducted by one institution over a period of time. This is especially important for IDRC's role in the promotion of sustainable natural resource management, since any individual IDRC project tends to be rather small and short-lived. This may be a blessing in disguise, since, as Krugmann points out, "large infusions of funds for solving local problems may be counterproductive by running the risk of undermining the (local) capacity that is supposed to be strengthened." (1994a, 4) IDRC has often found that small grants programs may be more effective in building the capacity envisioned in a project's objectives than some of our larger efforts over the years.

Research networks

A growing trend is discernible in IDRC-supported projects: more and more research networks are being supported and created. Networks benefit development efforts in two key ways. In the first place, they help to counteract the effects of the common "lack of coordinated [anti-desertification] strategies on the part of both governments of countries involved and donor institutions", or even local governments and non-governmental organizations. They provide a common knowledge base and serve to enhance communication among the many players on the field, across regions, countries and between and even within communities. In this way, research looking at efforts to stop, control or reverse land degradation can be coordinated, cross-fertilizing each other and eliminating duplication. In the second place, many institutions (large and small) working on these issues in Africa are weak; they have few funds and staff do not always have adequate training. The capacity for local research and action is therefore severely compromised. Krugmann points out that:

networking tends to provide surrogate institutional functions and service for members of the network, such as peer review, pooling of resources, or risk sharing. At the community level, networking among communities is an important mechanism of empowerment which allows local people to be more resourceful in the "fight" against desertification...(1994a, 3)

The Arid Land and Resource Management Network in Eastern Africa, otherwise known as ALARM (91-0151), covers the ecologically fragile areas of Eastern Africa. The expected output of the project is the creation of awareness that land tenure and the related policy issues in arid and semi-arid lands can be responsible for environmental degradation. The project also hopes to influence policy and local practice around these issues, mobilizing different stakeholders to work together. Several countries are involved in the project and a number of young researchers from the region are expected to be trained through its activities. The research will examine gaps in land laws and land reforms, will monitor changes in tenure, land use and pastoralism (especially the issue of displacement of pastoralists), and will examine the issue of sedentarization of once migratory communities. It is expected that understanding these issues can lead to the development of appropriate intervention strategies which, in turn, will lead to more sustainable land use. The research results will be of particular benefit to policy makers in the region.

The move towards support for multi-sectoral, multi-disciplinary and participatory research methods has initiated a concomitant shift in the very manner in which IDRC staff actually work, in how they relate to each other and to the researchers. The process is a learning one for all involved; perhaps the greatest lessons learned to date have been the need for enormous openness and flexibility and the benefits of taking risks. Working with people (and technologies) as opposed to only with technologies is a risky venture; it is often slower, more complex and characterized by the unexpected. The results, however, more frequently better the lives of those who most need it and provide a greater reward for all involved.

LESSONS LEARNED: RESEARCH ISSUES

Mixing the technical and the social

What have we learned about what research to support, i.e. which issues need further research? The first issues which come to mind are the technical issues - techniques and tools to control or reverse the desertification process. The list of IDRC project themes over the years (on p. 4) gives a broad sweep of the areas in which technologies need perfecting or new technologies need to be developed. However, it is often said that "technical means are known to reverse environmental degradation, but the social tools required to facilitate their use are only faintly understood." (Freudenberger, 1989, 37) Finding the appropriate mix of the technical and the social in a research project is one of the areas which IDRC has been exploring in its consideration of how to do research - as mentioned in the last section. It is also an issue which itself warrants more research: IDRC-supported projects have shown over and over again that we need more information about and experience with developing technologies which will both address the ecological damage and meet peoples' needs and priorities. This does not, however, imply that purely technical (or purely socio-economic) projects may not have a role to play in combatting desertification. They may, in fact, be essential. It does mean that such projects will have to be carefully designed and that the researchers will have to justify very conscious decisions to proceed in such a manner.

"Irrigated Plantations" - Senegal (88-0113) is an interesting case as the original objectives included both technical and socio-economic studies; however, the socio-economic study was only partially completed, leaving the technical conclusions open to question about the possible effects on the intended beneficiaries. The project's objective was to combat the effects of drought and desertification in the Senegal River basin - to make the basin self-sufficient in fuelwood and lumber (while protecting crops) by establishing irrigated forest plantations within agricultural areas. The specific objectives were to: assess wood production in relation to wood supply; develop silvicultural methods for irrigated forest plantations; and introduce trees into irrigated systems, taking socioeconomic constraints into account. The project concluded that intensive irrigated silviculture was indeed one way of developing wood production to meet demand; however, the impact on the local people of implementing such plantations (and therefore their ultimate success) was left unknown.

Social issues for research

The question of the "mix" of technical and social considerations points, yet again, to the concern over participation of local people in research projects.

Here is a prime example of an area in which more research is needed about how to do research. To approach research *with* the people in an appropriate manner, researchers and local people, between whom sometimes there may be little distinction, need far more information *about* the people, their relationships with each other and others as well as with the natural environment. Issues such as: inter- and intra-household relations in a community; class, gender and race relations within and among communities; religious affiliations; settlement and migration patterns; patterns and institutions of customary authority and their relation to official government bodies are among sources of information which can prove key to the success of anti-desertification projects. For a detailed exposition of these types of issues, the reader is referred to an excellent review of the literature and annotated bibliography on the social dimensions of desertification by Evers (1993b). A paper submitted by the International Fund for Agricultural Development to the First Session of the Negotiations for a Convention to Combat Desertification (May 1993) provides a brief overview of many of these points and states clearly that: "...desertification...is primarily a function of the land use strategies being pursued by those who depend on dryland resources for their livelihood. These land use strategies, in turn, are conditioned by environmental, socio-cultural and economic factors...[An understanding of] the broad international, national and local processes which contribute to poverty and unsustainable agriculture...is a basic prerequisite for the eventual definition of strategies to address desertification and mitigate the effects of drought." (1)

"Women and Biodiversity of Food Crops and Medicinal Herbs" (93-0034) is a project which aims to facilitate the empowerment of local communities in four different parts of Africa in safeguarding, conserving and controlling their resources of food germplasm and herbal medicines. Over the years, women have accumulated vast knowledge about crop science, a knowledge which has extended to such specialized fields as plant breeding. Women play a crucial role in household food security as custodians of seed selection and post-harvest storage of seeds. They know when to plant, how much and where. During the "hunger months" (the period between planting and harvesting), women are often responsible for applying coping strategies which they have devised over the years to sustain their families. Recent changes have translated into a slow erosion of women's knowledge in these areas. Among its specific objectives, this project aims to find ways to record and document systematically women's wisdom and techniques before they are lost, to strengthen them and ensure that they will be passed on to future generations. It is quite likely that some of this traditional, gender-specific knowledge might serve as the basis for, or complement, efforts to combat desertification.

The "Water/Land Management" project in Egypt (92-1501) has just gotten off the ground. The research site is on the northwest coastal region of Egypt, inhabited by an indigenous Bedouin population which traditionally has been pastoral. The project is an excellent example of one in which information about the social structure of the Bedouin communities, within and between tribal units, is being collected as a key component of the project's objectives. The population has gradually been shifting from a system entirely dependent on natural grazing to a system of partial cultivation with fruit gardens and barley production in selected areas; the transformation from pastoralists to semi-sedentary cultivators has been very successful. However, land use intensification, the new settlements of the indigenous people and external factors have created new and potential problems, including greater crop sensitivity to drought, loss of soil fertility and soil erosion. This project is examining the key processes that need to be understood for sustainable land management in the coastal region. The objective is to develop an integrated spatial model of Bedouin resource management systems and to assess its sustainability under international, regional and local change scenarios. The specific objectives include: evaluate efficiency of water collection systems; document long-term changes in grazing land vegetation cover; evaluate horticultural production; evaluate consequences of internal and external forces on human and animal population dynamics, production systems and socio-economic structures within and between Bedouin tribal units; develop models of the new Bedouin resource management systems with Geographic Information Systems (GIS) as the integrating tool; evaluate extension needs and programs for the management of dryland tribal communities with special focus on agriculture and household needs; and provide training for the Egyptian researchers in the use of GIS technology for resource modelling and the use of Rapid Rural Appraisal techniques for evaluating the socio-economic conditions and processes in the Bedouin communities.

Local knowledge & adaptive strategies

In the previous section, I discussed the role of local knowledge in the elaboration of research methodologies. Here again, more research on the substantive content of local knowledge is required. What do people know, how do they learn it or pass it on or how is it being lost and how can it be strengthened, how is it or can it be useful for present problems, and how best can or should so-called scientific knowledge and local knowledge complement each other? People who live in the drylands have evolved ways of adapting to their difficult environments - and they continue to do so. These traditional "adaptive strategies" are dynamic and vary greatly from region to region. Legge distinguishes them from coping strategies which emerge over a shorter timeframe to "attempt to deal with crises arising from drought, famine or economic and political marginalization" (Legge in Evers, 1993a, 13). Local or indigenous knowledge and adaptive or coping strategies have long been the key

to the survival of people in dryland environments; they are finally being recognized as an essential element of any future survival strategies.

"Root and Tubers II", Zanzibar (85-0192) was a project which sought to identify and improve root and tuber crops already used by local people as part of their strategy for food security in drylands. These crops often serve as drought coping mechanisms by providing food at critical times when seasonal food crops are not available. They have a long shelf life or can be stored in the soil and are very durable and provide food for consumption and cash as well as limited livestock feed. Such strategies, which produce crops that can be easily stored for use during the dry season, are an effective way of preventing famine and land degradation. The activities of the project included the identification and multiplication of high-yielding, pest and disease resistant sweet cassava varieties, the development of improved varieties of sweet potato, yam and cocoyam as well the fine-tuning of cropping practices and the control of cassava pests. Training at the on-farm level was conducted for both the farmers and scientists.

The project "Pastoral Systems of the Maghreb - Morocco" (89-0265 Phase II) was discussed earlier (p. 14). The objectives were to produce an analysis of the research zone, study the institutional organization, action strategies and economic dynamics in the region and establish methods to improve pastoral output. As mentioned, the interdisciplinary research team conducted a comprehensive study of 148 pastoralists and after numerous visits to the zone, one research team member stayed on with the group of pastoralists under study. This latter approach to the research was undertaken once the project team realized it was the only way to gain a clearer picture of the pastoral system practised in the area while learning about the pastoralists' living conditions and gaining a better understanding of their motivations and strategies. The strategies the pastoralists have developed over the years to deal with their precarious environment include: limiting herd size, exploiting fodder resources with caution, and relatively extensive emigration. The pastoralists are keenly aware of their uncertain living conditions, while also being very clear about the extent to which they consider themselves an integral part of their environment. They seem to have far less interest in intensifying stockraising than in safeguarding their extensive production system and protecting their way of life from vanishing altogether. Strategies are agreed upon through management by consensus. The new phase of the project, initiated in 1991, is expected to develop a system where pastoralists and local technicians would jointly monitor experiments and the improvements proposed for the zone. These activities would help researchers understand how pastoralists perceive the rangelands ecosystem in relation to their herd management methods. The study would lead to the development of concrete measures to improve pastoralist potential, using pastoralists' knowledge and present adaptive strategies as a base.

As part of its activities to support the process around the elaboration of the Convention to combat desertification, IDRC sponsored a series of three workshops prior to the signing of the Convention. Program experience from projects such as those mentioned above led IDRC to choose as the theme for the first of these "The Impact of Indigenous Knowledge and Traditional Coping Strategies on the Prevention or Mitigation of Land Degradation and the Desertification Process in Africa"; the workshop was held in Cairo in January 1994. A number of recommendations were proposed by the participants and can be found in Annex 1. The recommendations will inform decision-makers in Africa, local researchers working in the area of desertification and IDRC program staff in their choices of research projects for future support.

If "the war against desertification will be won or lost at the local (household, community) level", then we know that local rural people (via their community-level institutions) need to:

- have greater control and responsibility over their local resources;
 - be able to command a greater range and level of resources (to be more "resourceful");
 - be able to participate in and influence higher-level decision-making processes by which they are affected;
 - be able to organize themselves more effectively at the local level by forming or influencing representative local institutions and interacting...with (the institutions of) other local communities by means of local(ly controlled) information and communication systems.
- (Krugmann, 1994b, 1-2)

Resource tenure

In light of this, the second workshop sponsored by IDRC, held in Dakar in March 1994, was about the "Impact of Natural Resources Ownership Pattern, Tenure and Access on Land Degradation and Desertification in Africa" (recommendations can be found in Annex 2). Its objectives were:

Firstly, to contribute to a better understanding of resource tenure systems in Africa, in order to sensitize all of the actors involved in the management and utilization of these resources to the positive and/or negative impact such systems could have on land degradation and the desertification process. Secondly, to identify and recommend tenure systems compatible with a sustainable management of natural resources. (Smith, 1994, 3)

Land tenure arrangements play a significant role in determining sustainability - a more significant role than has been recognized in the past. Recent experience cannot escape the conclusion that property relations, by regulating access to natural resources and the rights to benefits from these, have a fundamental impact on management of these resources. Conflicts over resource use are becoming more and more common, both within and between small communities and larger regions; further environmental degradation due to such conflict can have devastating effects. El-Mekki describes the situation in Sudan as one in which both famine, drought and desertification as well as civil conflict are the related outcomes of an historical process led by political, social and economic factors. Peasant communities have been marginalized and subjected to "pressures imposed on them by national development strategies"; these pressures have included significant changes in land tenure arrangements. (in press, 40) Uncertainty of land tenure poses particular problems for refugees and migrants in the process of resettlement, as IDRC has learned through several projects, including the "Resettlement of Displaced Populations in the Commune of Tombouctou", Mali, 88-0346, and "Drought and Resettlement", Ethiopia, 86-0215.

Traditionally, local institutions served to determine land tenure through customary law and enforcement (formal or informal). Many colonial governments attempted to substitute their own laws for these systems (or sometimes to adapt them), but did not succeed in wiping them out. The resulting mix of systems, coupled with population growth and a host of social and economic changes, has led to a lack of clarity and general confusion over ownership and management of natural resources in many places in Africa. Many local management institutions have gradually been breaking down under myriad pressures and the state finds itself unable to replicate the traditional role of these institutions. There are lessons to be learned both from cases in which local institutions have broken down as well as those in which they continue to act effectively as resource managers.

**Communal vs.
private property**

Modern property regimes in Africa have tended to follow the Western preference for privatization over communal or other forms of property relations. The "Tragedy of the Commons" argument suggested that privatization, by providing individual ownership and management, would motivate the diversification and intensification of agricultural production as well as natural resource conservation. Recent studies around the world, however, have argued against the concomitant point made by the "Tragedy of the Commons" argument - that resources for which no private owner is

identified will be freely used by anyone and therefore degraded - while also challenging the conclusion that privatization is the answer to sustainable management of resources. "Experience in Tunisia, for example, shows that although privatization of land in the steppes led to a diversification and intensification of agricultural production, it also resulted in excessive resource utilization, and hence degradation...Further evidence from elsewhere clearly shows that attempts to ensure tenure security..through privatization often impacted negatively on the environment..." (Smith, 1994, 5-6) True "commons", owned and consciously managed by a designated group of people, can be a viable method for sustainable management. Local people in many parts of Africa, especially pastoralists, have managed natural resources communally for centuries. Land tenure changes whereby communal rights are not recognized and/or are revoked and privatization or state control is invoked have often served to reduce people's access to key resources and therefore eroded their quality of life. Pastoralists are particularly affected by such changes, since their nomadic lifestyles, developed to suit the environment they inhabit, are often incompatible with private property relations. There is currently much discussion about when common property arrangements should be returned to or strengthened or when they are no longer viable since the social and institutional structures which once supported them have disappeared and cannot be recreated.

In the "Pastoral Systems of the Maghreb", Algeria (89-0265 Phase II), a study of the land ownership systems was the first specific objective. (The Moroccan component of this project has already been mentioned twice). The main objective of the project was to achieve a sustainable increase in production and improve the living conditions of small and medium-sized communities of pastoralists and agro-pastoralists on the Algerian rangelands while halting the rangelands' deterioration and fostering their regeneration. The land ownership system and conflicts were explored by means of monthly exchanges with 20 agro-pastoralists in two communities. The reality uncovered is described as follows. The general strategy of pastoralists in these areas is to appropriate rangeland and extend grain-growing activities. Barley, grown on land ill-suited for it, is used primarily as fodder. Its production serves to confirm the grower's right of ownership to the plot on which it was grown, a plot no longer used by the commune as pastureland. The "race for land" and the rapid transformation of the rangelands from communal territory to a patchwork of ever-larger plots, privatized de facto, attests to the fact that traditional, communal farming methods are no longer being widely used. The social structures which once served to apportion rangeland use among those entitled

to it are no longer able to arbitrate cases of conflict nor to determine the way the land will be used. The effect of cultivation upon rangelands is twofold: first, cultivation cuts into the total range area and reinforces the dominant position of the more prosperous social classes who can afford to clear, fence in and work new land; second, grain-growing destroys soil structure making the land vulnerable to all types of erosion. The soil ends up completely sterile, loses all production potential and yields to encroaching sand dunes. In this case, the project concluded that further studies were needed to find ways to replace confrontational rangeland exploitation methods with an approach that preserves the historic rights of local communities and guarantees the sustained productivity of the pastoral sector, in an open economy, with the aim of meeting Algeria's requirements for pastoral products.

The "Arid Land and Resource Management Network" or ALARM, in Eastern Africa (91-0151), has already been described above (p. 16) as an example of a network project. The expected output is the creation of awareness that land tenure and the related policy issues in arid and semi-arid lands can be responsible for environmental degradation. The project also hopes to influence policy and local practice around these issues, mobilizing different stakeholders to work together. The research results are expected to be of particular interest to policy makers in the region.

Alternative livelihood strategies

In the economic sphere, several lessons have been learned, both on the micro and macro levels. Most dryland dwellers are marginal groups within their regions (pastoralists, small/subsistence farmers) and their integration into a market economy can sometimes benefit them, but it can also make them that much more vulnerable to market changes. For example, some pastoralists "have been able to diversify their economic activities by trading, selling milk, and crop farming." (Evers, 1993a, 11) Being marginalized, however, means that changes in the market can hit them particularly hard, since they have fewer resources upon which to draw for alternatives. IDRC has supported several projects, particularly in recent years, which try to find viable, alternative livelihood systems for people living in the drylands.

Rural peoples are rarely dependent upon only one activity for their livelihood; however, most of their traditional activities do draw upon primary natural resources and it is unlikely that this can or will change. People's traditional adaptive strategies are often no longer sufficient to handle the recent natural

and social upheavals and therefore there is a great need for "alternative and supplementary livelihood systems to reduce pressure on land-based resources" (Berry et al, 1992, v) or what Mendez calls "a systematic diversification of the rural economy." (1993, 4) Most desertification control efforts to date have had a narrow focus on land and natural resources management and, as is clear from the above project examples, the problem is more complex and multifaceted and requires more holistic approaches. (Ibid. 2)

The promotion of alternative livelihood systems can be carried out at a number of levels, starting with activities that are linked to the production of the land but are practically non-extractive or have relatively low extraction levels...Another level would involve the processing of primary products, whether traditional or not. A third level would be linked to non-consumptive uses of the land, such as tourism or recreational activities. Finally, activities could be directed at developing artisanal and light to medium industrial production or services, and public works. (Ibid. 4)

IDRC has been concerned with the development of alternative livelihood systems since the 1970s. The project "Gum Arabic and Rangeland Reforestation", Senegal (72-0096, 74-003, 78-0104) was part of a plan to combat desertification. Its objectives included: to maintain and increase the zone's gum production, to improve the landscape and boost the local economy; to disseminate methods of propagating, utilizing and managing gum tree plantations to institutions and the rural population; to provide institutions and the rural population with selected gum tree species and varieties; to maintain and enhance fodder production potential in order to combat the rapid deterioration of the vegetative cover and the decline in range resources caused by overgrazing. It was expected that these objectives would lead to a rise in the local population's income while reforesting the area and therefore reducing the pressure on the natural resource base.

"Ligneous Fruit Trees", Senegal (91-0122) has already been described above (p. 8). It is an example of a project which may contribute to increasing and diversifying rural incomes while also creating additional food resources and improving the forestry system in the area. The project is developing superior varieties of jujube and tamarind species for which the peasants find many uses.

The objectives of a project on "Aromatic Plants", Morocco (92-1011 Phase I and II) are to establish methods for exploiting so-called "aromatic" plants in order to fight encroaching desertification while also boosting the income of the rangelands' population. Aromatic plants, or herbs, constitute a natural vegetation cover and certain species in this area were significantly overgrazed. Some communities distil herbs to produce aromatic extracts but disorganized and immoderate harvesting have led to the medium-term disappearance of many plant species and the progressive desertification of an already fragile environment. During Phase I of this project, two pilot distillation devices were built. Specific work was done on wild sage and verbana essential oils and in fact, verbana essential oil was produced and marketed in Morocco for the first time; growing verbana is now four times more profitable than it was before. In Phase II, which began in 1993, the specific objectives are to: study the impact on ecosystems of exploiting aromatic plants in an unplanned fashion; identify, select, introduce and improve aromatic plant species; improve distillation methods; use essential oils to create higher value-added finished products; disseminate results to users and provide support for the production sector; market essential oils and other finished products.

Economic benefits to participants

The success of many a project has hinged upon the economic return to the participants. Without an immediate economic benefit to them, intended beneficiaries of a project are not motivated to participate; the struggle to survive poverty leaves little time or energy for projects which do not address people's immediate needs and priorities. Mansuri writes that: "conservation activities do not take place unless they offer tangible, proximate, and individual benefits to farmers." (1994, 3) This is a lesson which has been learned the hard way in many projects, research projects included. Many of IDRC's early support to social forestry efforts suffered from this problem. The wisdom of the times suggested that support should be extended to the growing of fuelwood species; meanwhile, farmers were much more interested in varieties which could be harvested for more than one source of income (eg. food, fodder, building materials, etc.). And since it generally takes some time before one can reap benefits from trees, varieties which could not be harvested for many years and did not bring any short-term economic benefit to the local people were rarely adopted and such projects were largely unsuccessful.

Trade, SAPs and desertification

IDRC hosted the last of the series of three workshops mentioned above in Nairobi in May 1994 on the "Impact of World Trade, Economic Policies and Structural Adjustment Programs on Desertification in Africa". A set of working hypotheses or assumptions was considered in the process of formulating the terms of reference for the authors of the review papers. These

hypotheses can themselves be seen as the suggestions of lessons learned (and areas where more needs to be learned) through IDRC-supported projects and related experience. Some of them are quoted below, while Annex 3 includes the recommendations from the workshop. Please note that although these hypotheses list "factors relating to trade, economic policy and structural adjustment programs (SAPs) that possibly or likely contribute to desertification...[the implication is not]...that all aspects of trade, economic policy and SAPs contribute to desertification or that the listed factors necessarily cause or facilitate desertification under any circumstances. For instance, in a changed context or with the adoption of different policies, some of the...noted linkages conceivably may help to arrest land degradation." (Krugmann, 1993, 4)

- Processes of progressive commercialization and commoditization of traditional African economies and natural resource systems, and closely associated increasing market liberalization and privatization of resource access and control, are at the heart of the environmental and social crisis and of the desertification problem on the continent.
- These processes are a reflection of recent trends of widening economic and financial globalism and have been facilitated or accelerated by current international trade patterns, the underlying international division of labour, orthodox SAP approaches, which taken together have tended both to lock the poorer (African) developing countries into a position of natural resource exporter at steadily worsening terms of trade (with little prospect of the necessary greater economic diversification) and to marginalize increasing segments of their populations.
- Soaring obligations to service international debt and the prescribed orthodox SAP philosophy of export-oriented development have been putting export pressures on African countries. In the absence of effective environmental regulation and/or in the interest of maintaining an international competitive edge among natural resource exporters, there is a greater risk that environmental costs of export production are not internalized in prices and that the export pressures will lead to environmental degradation and desertification.
- In many African countries, new cash crop schemes for export...have ignored traditional resource use and property rights, displaced local small-scale cultivators and/or pastoralists toward more marginal lands,

and thus eroded the sustainability of their land use systems while often not being sustainable themselves, with a resulting greater (potential of) desertification.

- Protectionism and other market failures in the North, notably heavy subsidies given to the agricultural sector, have led to international market distortions and undermined export prices and prospects for poor countries in the South, with clear risks for desertification and social decline in the South...
- Heightened global technological and economic competition and innovation...risk marginalizing poorer countries in the South which do not have the human and financial resources to provide the incentives...to keep up with the international pace. This tends to prevent the poorer countries from broadening their production base, perpetuates their direct dependence on the natural resource base and on primary commodity exports, with adverse consequences for the environment, including desertification...
- SAPs now...virtually constitute economic policy on the continent. Aside from export-related international economic issues dealt with above, orthodox SAPs may lead to or facilitate desertification in various ways. Cuts in government budgets (recurrent expenditure and investments in infrastructure) may reduce government support to near-subsistence farmers and agropastorists for inputs and implements and thus erode livelihoods and degrade the environment. Greater reliance on markets and prices (without concomitant institutional reform and government support) may further marginalize the weakly integrated "hinterland" (such as marginal drylands). [Also important is the impact of privatization of land tenure and property rights which has already been dealt with above.] (Ibid. 2-3)

Collection and management of information

IDRC has been increasingly active in the area of information collection and analysis systems for the control of desertification. Projects have clearly indicated the need for both the collection of more data and for more effective management of that data - a need articulated by researchers and policy makers as well as local people. The United Nations Environment Program (UNEP) has suggested that the types of information necessary "can broadly be divided into the following categories:

- the physical, social and economic indicators of desertification
- successful local level methodologies and technologies for combating desertification
- the economic and social costs of desertification and the projected socio-economic results of programs and projects designed to introduce sustainable development
- early warning systems
- methods for the efficient dissemination and application of information collected and analyzed
- a monitoring and evaluation system for tracking implementation of the Convention's provisions." (Cardy and Stiles, 1993, 1)

IDRC-supported projects collect much of this type of information. Several projects also address the specific development and refinement of computerized information systems to assist in the collection and analysis of information.

In 1977, IDRC assisted in the creation of RESADOC - "Sahelian Scientific and Technical Information Network", Mali (77-0100, 82-0220, 83-0316, 88-0015) - and continued to provide support for many years. RESADOC was created by the Permanent Interstate Committee for Drought Control in the Sahel (ICDCS - West Africa) as a regional information network to improve the management of technical information originating in the ICDCS countries and facilitate access to relevant, recent information originating elsewhere. The network is a cooperative, decentralized information system that acts as a link among a variety of documentation systems in order to collect, process and disseminate scientific and technical information on the Sahel. A computerized database of almost 10,000 bibliographic references has been created; support has been provided for national documentation centres and national coordinating structures have been instituted in most countries; training has been provided for more than 400 specialists and technicians in the field of documentation and documentary data; national networks have now been established in most of the participating countries; eight subject bibliographies have been compiled and distributed. RESADOC plays an essential role in managing and disseminating vital information on the Sahel to those who most require it.

The project "GIS for Soil and Water Conservation" in Tunisia (91-1019) has as its general objective to establish methods for the joint development and use of GIS and remote sensing techniques to conduct engineering studies relating to water and soil protection in the country. The specific objectives are to: identify needs and constraints associated with GIS use; analyze the human, institutional and information-related environment; prepare a book of specifications for the localized data management system; enumerate and examine mechanisms and methods to collect, process and analyze pertinent data; and conduct a detailed study of activities relating to the establishment of watershed development projects, information needs, and methods and software that are being or could be used. The use of remote sensing and the GIS to map natural resource utilization patterns is a new way for planners and engineers to study resources; they are high-performance tools which will enable the Tunisian authorities to determine faster and better ways of developing their watershed areas.

IDRC has also learned valuable lessons about utilizing and disseminating the information which IDRC-supported projects collect and the research results they generate. This subject will be dealt with in more detail in the next section; however, for all we have learned, it is obvious that further research about how best to utilize and disseminate research results would be invaluable.

The "Casuarina" project in Egypt (75-0048, 80-0027) was a two-phase project whose aim was to provide fast-growing and drought-resistant trees that in the long term would offer better protection to cultivated areas in the desert and generate additional income to small-scale farmers. Focus was placed upon Casuarina, the species most commonly used in shelterbelts in the land reclamation areas in Egypt. Individual selection and control breeding of Casuarina led to the conclusion that three indigenous varieties of Casuarina performed the best and should be promoted throughout the region. Of note in this project is the length of time (a decade) it took for farmers to begin to recognize and integrate the shelterbelt techniques into their own agricultural management practices. Greater awareness of methods of dissemination would have been helpful earlier on in this project - including the understanding that full participation by the farmers themselves acts as the best tool for adoption of new and appropriate techniques of natural resource management.

"Governance lag"

Part of the concern over effective dissemination is how to effect policy change at all levels. It is familiar experience for research institutes, non-governmental organizations, local groups and the like to have information in hand which could be useful for those making decisions about natural resource management, but to have no effective means for getting the information to the decision-

maker in a quick, understandable fashion. It is also the case that information about, for example, land degradation or drought, is sometimes inadequate for the purpose of decision-makers. It may be incomplete, itself raising other questions thought to be key to any decision (eg. bio-physical signs of drought without any socio-economic indicators will not give any clear idea of the urgency or type of action to be taken). Information might even be contradictory - especially since so many facts about the desertification process are unknown or so complex. Again, there will be more about this topic later, but it is another case where further research would be useful about how best to collect the most relevant information and how best to translate it into a package for effective dissemination and communication to policy makers. Abate and Ahktar write about a "governance lag": information about desertification is being collected and knowledge is growing, but large "deficits" exist (in content and process); therefore, strategies to combat desertification over the long and short term are often developed too late to benefit the people suffering from the problem. (1993)

Population

As a final note in this section, there is no pretending that population dynamics are not a factor in the desertification process. Population is certainly not a deciding factor in isolation, but in interaction with many other factors (some of which have been mentioned above), it cannot be ignored. Nonetheless, I will not explicitly consider it in this paper and will simply state that IDRC has, and continues to have an interest in research on population issues, but an interest which now expresses itself through more integrated approaches than singleminded birth control efforts.

The "Water/Land Management" project in Egypt (92-1501) which is described on p. 19, has as one objective to evaluate the consequences of internal and external forces on human (and animal) population dynamics, recognizing that population growth must be understood in relation to resource availability to meet the project's ultimate objective of developing an integrated model of sustainable resource management.

The research issues outlined in this section are diverse and interrelated, indicating the complexity of the concept of desertification. They do not serve as an exhaustive list of issues which require further research. However, they do point to several areas in which IDRC has been and will remain active and which IDRC's staff and supported researchers have identified as key priorities in the fight against desertification (for IDRC and for other organizations).

LESSONS LEARNED: DISSEMINATION AND UTILIZATION

IDRC-supported projects in the area of desertification have taught us quite a bit about what happens after the research is done. The typical project in years past might have included training of researchers and extension agents, the publication of results, and perhaps a regional workshop for other researchers.

IDRC has begun questioning what is meant by "utilization" and "dissemination" of research results and how results can be used more effectively. It has become clear that researchers imparting results to their peers and sometimes to extension agents does not constitute true "utilization". There is little point in supporting excellent research if the results will not be used either by local people to improve their livelihoods and/or by policy makers to effect change which will improve livelihoods. Desertification is a process which does not wait for us to develop perfect methods of communication to suit every context (since both utilization and dissemination boil down to effective communication between people).

Effects of research approach

The most important lesson IDRC has learned is that how the research is done greatly affects what happens after the fact (as indicated by the Casuarina project described above on p. 30). If research is multi-sectoral and multi-disciplinary, it will better serve the multi-faceted needs of both local people and policy makers (not that these are always different individuals). If research is participatory in its approach and recognizes local people's economic realities and incentives, then half the work of dissemination and perhaps of the promotion of utilization is already done. If the research issues are identified, not by a researcher's personal interest, but by the users affected by their reality and based upon already existing local knowledge, the relevance of the research will greatly increase the chances of its results being useful.

The "Dry Zone Afforestation" project in Zimbabwe (87-0014) identified drought-tolerant, fast-growing multipurpose tree species and provided guidelines for the successful introduction of these species into dry-zone farming systems where land is owned communally. The project adopted both on-station and on-farm/on-pasture approaches and sought to disseminate research results. The researchers took a different approach to extension, in which the delivery of technical information was carried out by the foresters themselves. At the on-farm level, it was noticed that smaller water catchments marginally improved growth but were not sustainable due to their cost. However, an innovative method of natural vegetative management was developed by a local councillor - a method which had a positive effect on the conservation of natural vegetation in otherwise overgrazed lands. This came to the attention of the researchers through their work with local people on the project.

The "Farming Systems Research" project in Tanzania (85-0255) was designed to develop low input technologies of farming suitable for semi-arid lands and to undertake the dissemination of these systems. The research outputs included improved farming systems specifically for the northern plains and some deeper understanding of the technical problems faced by farmers. On the whole, the project followed conventional farming systems research wisdom with an added extension element for the most feasible and acceptable technologies and innovations. However, farmer involvement was still limited. The farmers only gave researchers the worst plots on which to carry out their research trials. Therefore, the research results were probably skewed and any advice given to farmers probably not very useful. In fact, one of the important findings of the project was that farmers failed to adopt the recommended varieties of crops because they found them too expensive.

Appropriate and timely dissemination

Direct efforts to consider dissemination and utilization strategies at the start of a project have greatly increased the chances of success. Much more needs to be learned about the variety of strategies available and their respective merits, but certain trends are evident, the popularization of research results being foremost among these. This includes the "translation" of results into forms comprehensible to local people - using local languages and traditional and modern media, for example.

The "Tree Seeds" project in Burkina Faso (85-0273 and 90-0002) is an interesting case in point. The objective of Phase I was to improve the quality and quantity of seed supplies available in Burkina Faso and other countries of the sub-region. The specific objectives were to: find and select the finest seed-bearing stands and perform a genetic evaluation of the material; study seed germination and evaluate a variety of methods to raise seedlings in nurseries; and study seed physiology and technology. Most of the project objectives were met, enabling nursery operators to produce better quality plants and cut production costs while increasing seedling productivity in the nursery. Phase II objectives were amended somewhat: to enhance and extend the findings and experience gained under the project by disseminating them to government technical services, non-governmental organizations and peasants, as well as to other countries in the sub-region; to strengthen human and material intervention capability; and to conduct research on seedling production methods and seed technology. The project team of the National Tree Seeds Centre (CNSF) recognized that without a concerted effort at dissemination, utilization on a larger scale would not materialize quickly. Below are some of the strategies used by the researchers to disseminate the results:

- A "best forestry nursery" competition was held on World Environment Day.
- Excursions were arranged in fifteen provinces. Participants viewed documentaries and listened to various rural organizations debate the role of CNSF in the struggle of desertification.

- Promotional spots were prepared for regular broadcast on radio and television in French and in the three main languages of the region.
- A six-day fact-finding trip was organized for academics from the country's 10 driest provinces.
- Project sites were frequently visited by schoolchildren. Posters depicting the Centre's activities were designed and distributed.

The Centre can now provide almost 70% of the country's seed requirements and its equipment and stocks are sufficient to meet a considerable part of the demand in other Sahelian countries. In light of the project's success, the countries of the ICDCS decided in 1989 to make the CNSF a Sahelian "Centre of Excellence" for tree seed technology. This means the Centre will play a leadership role in implementing tree seed programs in the region. It will provide neighbouring countries with technical and scientific support while helping train their managers and supplying them with plant material. The Centre will share the knowledge it has acquired and contribute to the establishment of additional national tree seeds centres wherever they are needed.

Influence on larger-scale projects

The criteria by which IDRC views the success of a desertification-related project include its positive effects upon policy-making and upon large-scale projects implemented by other agencies and governments. IDRC-supported research experience has several times provided the base for larger-scale efforts. The Tree Seeds project described above is one such example; the regional programs which the Centre will play a leadership role in implementing are to be introduced by the national governments with support from the Food and Agriculture Organization (FAO) and the International Union of Forestry Research Organizations (IUFRO).

The "Gum Arabic and Rangeland Reforestation" in Senegal (72-0096, 74-003, 78-0104) has already been described above (p. 25). The objective was to establish plantations in the areas around water supply points in the Sahel to enhance the environment and to provide pastoralists with more woody fodder for their herds. Dissemination of results was planned from the beginning of the project and successfully carried out; many villages have applied the project's achievements. The project is known to have inspired similar activities in other Sahelian countries and beyond. Its impact on Senegal's natural resource management policy has been considerable. A National Gum Tree Action Plan (PNAG) was directly inspired by project activities and has served as a vehicle for large-scale intervention by many organizations, including non-governmental organizations and a variety of associations.

Addressing the "governance lag"

Effective policy-making requires the right kind of information for decision-making and requires that the information be presented in a manner useful to policy makers. The "governance lag" described earlier must be addressed from the start - if consideration of dissemination of research results for the purpose of influencing policy is left until a project is over, the process becomes more difficult. Funds may no longer be available or the results may need to be transformed in some manner to make them relevant to the policy maker. The results may even be found to be irrelevant to the needs of the policy maker, especially if the research was designed with no original consideration of its possible usefulness for policy. IDRC-supported research experience has led to an increasing number of projects which directly support efforts to change or influence policy.

"Remote Sensing Applied to the Assessment of Woody Resources", Senegal (92-0612) supports the government's new forestry code, which provides for a survey of wood resources, monitoring of changes, conservation of forest potential, wealth and diversity, and operational wood resource management. The project will: use survey methods established after validation at various levels while improving the methods as new developments emerge; prepare reliable resource maps on the basis of accurate survey methods using remote sensing data; train forest development agents in the survey methods developed under the project. Results will be broadcast over radio stations in the region in national languages. The results should serve as an initial step towards a comprehensive survey of the entire country's resources of wood. It is hoped that the project will both provide the community with means to control and manage its wood resources while also providing planners and policy makers with a clear picture of resource availability and use - from which sound decisions can be made.

The "Desertification Convention" project (93-0015) has several components, including the series of workshops described earlier. It is also providing assistance to key African non-governmental organizations (NGOs) to build longer-term capacity in informed national-level advocacy on desertification issues. It also assisted them to inform and participate in the international negotiating sessions leading to the Convention. As part of these activities, five NGOs from different regions of Africa are being provided with the necessary support to hire full-time resource persons to be able to conduct the necessary background research and liaise with the different stakeholders at the national level to prepare position papers and influence the national and international desertification agenda. Provision is also being made for support to regional electronic networking and conferencing among the NGOs to facilitate interaction and information exchange.

Effective utilization of research results by local people, researchers and policy makers requires a well-planned strategy developed in the initial stages of any project. This is the key lesson learned through IDRC-supported projects over years of attempts to productively disseminate research results. How to develop and implement such strategies are questions for which answers are evolving; the essential element of creativity in the face of specific and differing contexts is better understood and accepted. There exist broad strategic approaches to dissemination and utilization, but experience dictates that there are no blueprints.

CONCLUSION

The experience gained from IDRC-supported projects has been both diverse and project-specific while also providing enough common themes and trends from which to distil broad "lessons learned". There is little doubt that IDRC now supports research which is conducted differently than in the past, looks at issues in a more holistic manner and handles the research results in a much more conscious and deliberate fashion. This is not only the case for desertification projects, but also for projects supported in many other sectors and fields. However, I would not like to give the impression that all possible lessons have been distilled and implemented. Project experience also indicates that there is room for improvement and refinement. IDRC staff and supported researchers have learned a great deal about desertification, its causes and symptoms and possible solutions; we have also learned that there is much we do not yet know.

Lessons learned

Below is a *summary of the lessons learned* as described in the text above. This summary is followed by a discussion of what we do and do not know about desertification and a series of *recommendations for research*.

1. "The war against desertification will be won or lost at the local level." Having said this, IDRC project experience indicates that there is much we do not know. There is little concrete experience in many circles with how to translate the implications of such a statement into action in specific local contexts.
2. Appropriate technology and policy are vital to the success of a project and must be developed with participation of local people, who find a technology or policy "appropriate" based upon a context-specific combination of factors, in which socio-economic, gender and cultural factors are key.
3. Many of the more successful IDRC-supported projects have become more integrated, i.e. 1) multi-sectoral (research concentrates less upon technical solutions and recognizes the interactions between ecosystem and production system components and sectors) and 2) multi-disciplinary (research combines biophysical and technical issues with socio-economic, institutional and cultural issues).

4. IDRC projects are more likely to achieve planned objectives if local people have a substantial role in setting needs and priorities and if dissemination of research results is targeted for users in an appropriate fashion (eg. in the local language). Who actually does research (eg. university-trained scientists or farmers themselves), where (eg. on or off farms), and why, are becoming larger concerns for IDRC-supported projects. The focus has been shifted from technology to people as projects have become more participatory, often relying upon the local knowledge of beneficiaries to inform key parts of the research.
5. IDRC has learned that the development of long-term relationships with targeted institutions, i.e. support extended for a series of related projects conducted by one institution over a period of time, can be very useful.
6. Small grants programs have also been discovered to be often more effective in building the capacity envisioned in a project's objectives than some of IDRC's larger efforts over the years.
7. IDRC is supporting and creating more and more research networks, allowing people greater access to resources for anti-desertification work.
8. To approach research *with* the people in an appropriate manner, researchers and local people need far more information *about* the people, their relationships with each other and others as well as with the natural environment. Issues such as: inter- and intra-household relations in a community; class, gender and race relations within and among communities; religious affiliations; settlement and migration patterns; and patterns and institutions of customary authority and their relation to official government bodies are among sources of information which can prove key to the success of anti-desertification projects.
9. We need more research on the substantive content of local knowledge. What do women and men know, how do they learn it or pass it on or how is it being lost and how can it be strengthened, how is it or can it be useful for present problems, and how best can or should so-called scientific knowledge and local knowledge complement each other? People who live in the drylands have evolved ways of adapting to their difficult environments - and they continue to do so. We need to know more about these traditional "adaptive strategies" which are dynamic and vary greatly from region to region.

10. IDRC-supported research has demonstrated that resource tenure systems in Africa have an immense influence on the sustainability of dryland resources. Without a clear understanding of the current tenure system or systems in any one locale, a project risks approaching its problematic with inaccurate assumptions.
11. As a result of lessons learned about the difficulties encountered by dryland dwellers as they attempt to integrate into a market economy, IDRC has become more active in supporting research which explores viable, alternative livelihoods for such people.
12. It has become very clear that the success of many a project depends upon the provision for an immediate, economic benefit to the intended beneficiaries of the project.
13. Experience over the years has taught IDRC staff about the complexities of economic systems in Africa, the role of SAPs and their relationship to desertification.
14. Researchers, policy makers and local people have articulated the need for both the collection of more data and for more effective management of that data. The importance of information management systems in anti-desertification efforts has become increasingly evident through project experience.
15. The most important lesson IDRC has learned about the dissemination and utilization of research results is that how the research is done greatly affects what happens after the fact. If research is multi-sectoral and multi-disciplinary, it will better serve the multi-faceted needs of both local people and policy makers. If research is participatory in its approach and recognizes local women's and men's economic realities and incentives, then half the work of dissemination and perhaps of the promotion of utilization is already done. If the research issues are identified, not by a researcher's personal interest, but by the users affected by their reality and based upon already existing local knowledge, the relevance of the research will greatly increase the chances of its results being useful.
16. Direct efforts to consider dissemination and utilization strategies (for policy-making, information-sharing and direct action) at the start of a

project have greatly increased the chances of success. More needs to be learned about the variety of strategies available and their respective merits.

These "lessons learned" about desertification and land degradation have led IDRC to take action in certain areas and to follow-up on particular issues. Many recommendations have been made, a large number of which can be found in the three annexes following this conclusion. The following discussion of what we do and do not know about desertification and the *recommendations for research* are adapted from parts of a paper by H. Krugmann, an IDRC staff member who has extensive experience with projects working to combat desertification in Africa.

"What we know"

We know that local rural people (via their community-level institutions) need to:

- have greater control and responsibility over their local resources;
- be able to command a greater range and level of resources (to be more "resourceful");
- be able to participate in and influence higher-level decision-making processes by which they are affected;
- be able to organize themselves more effectively at the local level by forming or influencing representative local institutions and interacting horizontally with (the institutions of) other local communities by means of local(ly controlled) information and communication systems.

We know that for the "war against desertification" to be won at the local level, local people, men and women, communities and institutions must be empowered to have control over their use of natural resources; this requires an enabling environment at national and international levels. We also know the most important elements that such an enabling environment must have.

At the national level, these include:

- more democratic (participatory) and decentralized political/administrative structures; viz. devolving authority over natural resource management to government levels that are as close as possible to the local people and institutions who are actually at the forefront of using and managing the natural resources (i.e. whose livelihood depends very directly on the integrity of the natural resource base);

- appropriate and diverse resource/land tenure and ownership systems and policies which reflect existing socio-cultural diversity across local settings and allow statutory laws to build on existing local customary rules, instead of undermining them;
- appropriate economic policies, flexible structural adjustment approaches, and marketing structures that enhance local rural marketing possibilities and improve (or at least not affect negatively) the terms of trade between local communities and larger-scale markets and between rural and urban areas;
- fostering local capacity for self-help and providing technical and financial support to local community institutions beyond that, on the part of non-governmental organizations, governments and donors;
- greater respect of and reliance on traditional local knowledge; formal education systems and policies that give greater weight to traditional local knowledge and strategies about how to combine it with modern scientific knowledge in natural resource management and use.

At the international level, these elements include:

- enabling, or at least not destructive, world trade patterns and policies which:
 - a) ensure access by poor developing countries to Northern markets;
 - b) allow these countries to build up and diversify their economic base;
- a gradual reduction in foreign debt obligations, if possible linked to progress in the creation of national-level enabling environments for more sustainable local livelihoods and concomitant control/reversal of desertification processes;
- appropriately coordinated and harmonized international donor assistance to the South.

"What we do not know"

There is little experience, however, with how to translate this framework into action in given local contexts - how to apply relevant knowledge, technologies and experiences and how to transfer and adapt these from one place to another. The issues of how to develop the local capacity for such application and experience and how to facilitate the underlying learning processes present

many open questions. At the same time, there is little experience with translating local-level research results into action at the national and international levels. There are many questions about how to forge and strengthen the links between the local and other levels or how to influence decision-making from the "bottom-up". It is in these areas that further research, capacity-building and action are needed. Specifically:

Recommendations for research

- There is a need to identify and evaluate more systematically case studies of different aspects (technical, economic, institutional, organizational, etc) of particular desertification control measures and programs which have worked or have not worked, and pinpoint the reasons why they have or have not worked. Further, it is necessary to experiment with capacity-building and learning processes at local and national levels as well as examine their influences upon decision-making.
- Little empirical information is available about the interrelationships between world trade and structural adjustment programs on the one hand and local desertification processes on the other, and how macro-economic policies and market-based instruments can be used to control, rather than facilitate, desertification.
- Further research is needed on appropriate land/resource tenure forms, in particular about: how customary and statutory tenure forms and contents intersect in particular contexts and how they can be made compatible; the effects of widespread privatization of resource tenure in drylands in Africa; and how diverse tenure systems could be developed/maintained.
- Another topic of great relevance is that of indigenous knowledge. The challenge is to effectively combine local traditional and modern scientific knowledge to address desertification problems. IDRC has recently spearheaded an initiative to examine and support grassroots indicators of sustainable and equitable development (IDRC, in press). Local people use a wide range of indicators to assess the state of the natural resources upon which they depend and to make informed decisions about their management.
- Another key area where further innovation is sorely needed is to develop project and program modalities appropriate for local-level

intervention. All too often, larger chunks of relatively inflexible financial support end up undermining the local capacity that is supposed to be strengthened. This issue raises questions like funding through what kinds of organizations, at what scale, with what mechanisms, controlled by whom and for what precise purpose.

- Under the Desertification Convention, the steps and actions to be undertaken within a given country to combat desertification will be specified in the Regional Annexes and, in greater detail, in the National Action Plans (NAPs). The NAPs will be the principal instrument for implementing the Desertification Convention and for the poorer countries to be able to get financial aid through the Convention process. There is a need to assist developing countries, particularly in Africa, in developing appropriate NAPs consistent with the above framework. This will require action research and experimentation, as well as capacity-building efforts. Donors may wish to respond to this challenge in a coordinated fashion. (Krugmann, 1994b, 1-5)

Canada is now a signatory of the International Convention to Combat Desertification. Among a number of initiatives which IDRC is planning as part of Canada's contribution to the implementation of the Convention is a set of related projects geared to providing support to the development and implementation of the NAPs.

Final words

IDRC has learned a great deal about desertification over its years of association and collaboration with people and institutions from all over the world. The "lessons learned" and the "recommendations made" as outlined above were elaborated through an interactive process of dialogue with IDRC project personnel and local people from developing countries, researchers from institutions across all continents, and other donors and activists (whether small, local NGOs or large, international donors). It is hoped that the lessons and recommendations will prove useful to all people active in combatting the tragedy of desertification and land degradation.

ANNEX 1

Recommendations of the Workshop on the "Impact of Indigenous Knowledge and Traditional Coping Strategies on the Prevention or Mitigation of Land Degradation and the Desertification Process in Africa".

The workshop took place in Cairo during January, 1994. Over 30 specialists, representing various regions of Africa, took part in the workshop which produced ten recommendations that were placed before the Committee negotiating the U.N. Convention to Combat Desertification.

Indigenous knowledge, as it relates to desertification processes, comprises a wide range of accumulated local experience about natural resource use and management techniques in both agricultural and pastoral systems, institutional and organizational arrangements as well as beliefs and values. All these dimensions need to be duly weighted and included in applying indigenous knowledge to development decisions and interventions at micro as well as macro levels.

Indigenous knowledge can be enhanced with the infusion of modern scientific knowledge (and vice versa). The challenge is to evolve the right mixes between indigenous knowledge and modern knowledge. This will require the creation of an enabling environment at national and international levels.

The recommendations:

1. Government officials should duly take into account, in the development and implementation of policies, indigenous knowledge as well as the experience and developmental perspectives of local populations.
2. Government officials should also take all the necessary measures to protect, preserve and use indigenous knowledge by creating an enabling environment that includes the support of focal local institutions and the development of awareness programs. Sufficient funds should be made available for that purpose. Channels should be created to enable representative local institutions themselves to promote the importance of their local knowledge and insist that their knowledge is relevant despite processes undermining it.
3. Given the importance of combining traditional and modern knowledge systems, research should be carried out on how adaptations and innovations are being made by local

communities and outside agencies to analyze these processes and contribute to the development of appropriate hybrid knowledge systems and enabling environments.

4. It is an imperative that mechanisms be found for the effective involvement of local representative institutions in higher level decision-making processes. To facilitate such participation, decentralization of authority over natural resource use and management is a necessary condition. Equity and democratic principles should be applied in the empowerment of local representative institutions.

5. In designing research and local level interventions the cultural, ethical, spiritual and institutional aspects of indigenous knowledge systems should be given full consideration.

6. Recognizing the fundamental ecological, social, economic and cultural roles of traditional pastoral and agro-pastoral production systems, it is important and urgent that public authorities create suitable conditions and provide sufficient support to the local populations for their continued viability. This implies, inter alia, that:

- a. political structures must develop new mechanisms to allow increased freedom of movement of people and herds in order to optimize the use of rangeland resources, including trans-boundary movement; and
- b. development plans should include provision for the equitable and sustainable development of pastoral systems and rangelands.

7. Indigenous knowledge and its use in local contexts should be documented by the communities concerned for their own use, access and control. Data bases should be created at local, national and international levels with a clear view toward further use and development of that knowledge. It should be recognized, however, that indigenous knowledge can be location-specific and captures local processes as well as facts and that for this reason its standardization and replication elsewhere can be a complex undertaking requiring adaptation and assessment through participatory research.

8. Special consideration should be given to gender-specific roles, vis-a-vis resource management, with women being recognized as important custodians of indigenous knowledge and their views incorporated into decision-making processes.

9. Formal education systems are all based on modern scientific knowledge to the exclusion of indigenous knowledge and illiteracy has often been taken for ignorance. It is an imperative to develop, apply and fund curricula that include indigenous knowledge for all

levels of education. To avoid the loss of local knowledge and skills it is indispensable to provide necessary support and improvements to informal education systems.

10. Adequate funds must be secured and appropriate projects and programs adopted to ensure the implementation of the above recommendations.

ANNEX 2

Recommendations of the Workshop on the "Impact of Natural Resources Ownership Patterns, Tenure and Access on Land Degradation and the Desertification Process in Africa".

The workshop, held in Dakar March, 1994, was attended by a total of 60 participants, representing various regions of Africa. Twelve recommendations were produced and placed before the Committee negotiating the U.N. Convention to Combat Desertification.

The recommendations:

1. Given the well-documented relationship between climate and desertification on the one hand, and land degradation/desertification (i.e. biomass and biodiversity loss) on the other hand, negotiators should ensure that the desertification convention be given equal weight and attention as other conventions on climate and biodiversity in order to tackle these problems of global concern in a holistic manner.
2. Africa is the least mapped and cartographed continent, with little archival or current data on quantitative resource dynamics and availability. Given the important roles access to such information could play in the formulation of appropriate policy options, efforts should be made to provide such cartographic and GIS data, and/or guarantee easy and inexpensive access to them when available elsewhere.
3. Legislative and administrative reforms should be undertaken urgently to evolve appropriate tenure systems that equitably guarantee access and clear property rights and obligations to all users including pastoralists.
4. Such tenure systems should be developed with the full participation of all actors and user groups, so that local socio-cultural peculiarities and ecological features are respected.
5. In this respect, newly evolved or evolving tenure arrangements that show evidence of equity and local relevance should receive recognition, support and legitimization.
6. Given the heterogeneity and hierarchization that exists at the local community level, often with strong interest groups that tend to be self serving, efforts must be made to ensure that the spirit of democratization permeates up to this level, and that the interest of minority groups, particularly women are protected.

- 7.** In this respect, special efforts must be made through research, education, and legislation to guarantee the rights of women to own and have access to land and other natural resources and incorporate these rights into tenure arrangements.
- 8.** In the same vein, access rights of pastoralists to grazing land and water sources that are gradually being eroded need to be guaranteed, documented and enforced.
- 9.** Common property regimes still exist in many parts of Africa, but competition for the unsettled areas, or seasonally utilised areas is increasing, and the commons are being threatened. It is important to protect these tenure regimes in ecosystems where they have obvious comparative advantages in terms of a sustainable utilization of the resources.
- 10.** The international community should harmonize its development programs and projects with national efforts and aspirations of the local populations, and through appropriate conditionalities encourage national governments to facilitate the development of tenure regimes favourable to a sustainable management of natural resources.
- 11.** Research and training programs need to be developed to reinforce the organizational and institutional capabilities of local populations so that they become effective partners to policy and development planners. In this respect, culturally appropriate participatory approaches that exploit the rich indigenous patrimony should be privileged.
- 12.** Appropriate training programs should also be directed at officials that implement tenure legislations and rights, as well as local population representatives, to ensure a proper comprehension of rights and obligations.

ANNEX 3

Recommendations of the Workshop on the "Impact of Trade, Structural Adjustments and Economic Policies on Desertification in Africa".

The workshop was held in Nairobi, Kenya in May, 1994. Some 35 people attended from 17 countries. The following are some of the recommendations they made and placed before the Committee negotiating the U.N. Convention to Combat Desertification.

The recommendations:

1. In order to be able to halt and reverse desertification in Africa, it is necessary to gradually reduce the continent's foreign debt obligations. This process should be linked to progress on the part of African countries in promoting national and regional enabling environments for the sustainable use of natural resources in drylands (see point 6 on national enabling environments below).
2. There is a need to assess the environmental costs of tourism which has become an important source of foreign exchange in Africa, and in some countries even surpasses agriculture as the major foreign exchange earner. Likewise, it is important to examine the distribution of benefits from tourism, at national and international levels. It is necessary to explore options of environmentally friendly ecotourism that is controlled and managed, as much as possible, by local communities and their institutions.
3. The prices users pay for the use of environmental resources should reflect the resources' true cost to society. The state does have an important role to play, and its capacity must be enhanced, to correct the failure of markets to reflect environmental costs in prevailing prices. Economic incentives and other means should be devised to ensure greater internalization of environmental costs in market prices. The state has a role here that is complementary to that of the market.
4. Community-based information systems must be established to support local decision-making, participation in higher-level decision-making processes, and social mobilization. Radio broadcasting is an important communication technology for the broader participation of local communities in natural resource management and conservation and related economic and trade mechanisms.
5. National institutions should be created to ensure access of all interested parties to decision-making processes for design and implementation of strategies to combat desertification. These institutions should provide fora for debate on trade and structural

adjustment issues, as well as on land tenure, indigenous knowledge, governance and other issues of relevance to combatting desertification. Without such institutions, e.g. officially mandated national desertification committees, expert input of research scientists, NGOs and grassroots communities will be lost.

6. At the national level, it is necessary to create an enabling economic environment to facilitate more sustainable resource use in the drylands. This will require, among other things: appropriate economic policies that are harmonized with social and environmental policies; flexible structural adjustment approaches that are continually adapted to changing local conditions; and marketing structures and policies that enhance local rural marketing possibilities and improve (or at least not affect negatively) local terms of trade.

7. The promotion of global trade at current international market prices ignores the failure of the market to internalize costs arising from desertification in Africa and elsewhere. Under current rules, the GATT is not well equipped to deal with this issue -- it assumes that the benefits of trade are greater than the environmental costs of trade liberalization. New institutional mechanisms must be developed to address trade-related environmental effects. The Desertification Convention affords a good opportunity to develop and use such mechanisms.

8. Practices by developed countries of dumping subsidized primary commodities onto African markets (example: exports of subsidized beef by the European Union to West Africa) should be discontinued. Such practices undermine the livelihoods of agricultural and livestock producers on the continent and hence contribute to land degradation.

9. There is an urgent need for effective fora to allow all relevant stake-holders from the North and South to exchange views, build consensus and influence global decision-making processes on trade, environment and development issues towards more equitable and sustainable patterns of world trade. The role of UN agencies, such as UNCTAD and UNEP, should be strengthened for this purpose.

10. To create an appropriate international economic enabling environment for more sustainable resource use in Africa, economic relations must be adjusted mutually (in North and South) so as to: ensure access by poorer developing countries to the richer industrial countries' markets; allow the poorer countries to develop and diversify their economies; permit sufficient levels and periods of protection of fledgling local industries that cannot yet compete at an international level; encourage regional trade and integration in Africa; and ensure consistency between trade, development and environmental objectives.

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