United Nations Environment Programme ISSN 0379-2455

Desertification Control Bulletin

A Bulletin of World Events in the Control of Desertification, Restoration of Degraded Lands and Reforestation

Number 30, 1997

UNEP

Desertification Control Bulletin

United Nations Environment Programme **Number 30, 1997**

Photo: Joran Fries, Sweden

Combining trees and bushes with agricultural crops (agroforestry), has a very long tradition in Africa

International events on Desertification Control issues

Editorial: Improved Science for Avoiding Conflict *1*

Summary of the tenth session of the Intergovernmental Negotiating Committee for the Convention to Combat Desertification *3*

UNEP Governing Council 19th session *7*

Desertification/Land Degradation and its control

Linkages Between Dryland Degradation and Migration: A methodology by D. Stiles *9*

National Strategy to Combat Desertification in the Republic of Kazakstan by Prof. I. Baitullin and Dr. G. Bekturova ... *19*

Towards Ecological Regeneration, Biodiversity Conservation and Environmental Restoration of the Thar Desert Ecosystem in India by Prof. K. Sinha *28*

Implementation of the CCD: Methodology approaches

Stakeholders' Participation in the National Action Programme (NAP) Process: Options and Strategies in Various Socio-political and Geographic Conditions by D. A. Marongwe *37*

United Nations Convention to Combat Desertification: Networking among NGOs - Basic Framework and Approaches by E. V. Ramnayya and Dr S. Rajakutty *46*

Saving the Drylands: Success stories in desertification control

Integrated Whole farm/Whole Landscape Planning by K. F. Johnson *58*

Survival With Moving Sands: The Northern Province community Forestry Project Ed Debba - Sudan by Mohammed Abdel Mahmoud Ibrahim *65*

News from UNEP

UNEP's Effort Towards the Implementation of the UNCCD 1995-1996 ..... *74*

People, Land Management and Environmental Change (PLEC) *76*

Progress News from Saving the Dryland Award - Winning Success Stories *78*

Book Review *80*

Problems of Arid Land Development

The Social Dimensions of Desertification: An Annotated Bibliography and Literature Review

Our Planet, Vol. 8 No. 5, 1997

The second edition of the World Atlas of Desertification

Success Stories: Saving the Drylands 1995 Award Winners

News of interest *83*

ICARDA News

Agroenviron '98

Request for articles

Cover: The Acacia is called a miracle tree because of its remarkable qualities. Dryland in the southern part of Kenya. Photo: Leonid Kroumkatchev, UNEP

The United Nations Convention to Combat Desertification (CCD) which came into force on 26 December 1996, lays out new measures to be undertaken by governments of affected countries and by those in a position to help. It is a comprehensive treaty, with an innovative participatory approach aimed at involving all stakeholders.

The core of the Convention is the development of national, sub-regional and regional action programmes to combat desertification. National action programmes are to be developed by governments in close cooperation with donors, local populations and non-governmental organizations (NGOs). In contrast to many past efforts, these action programmes must be fully integrated with other national policies for sustainable development. They should be flexible, able to be modified as circumstances change.

For this approach to work it is essential that people at all levels are aware of the strengths of the drylands, as well as the causes and mechanisms of desertification and of possible solutions to the problems. Accordingly the UN-CCD emphasizes the increasing need to raise awareness and knowledge of dryland issues globally, particularly among government decisionmakers, affected and non-affected community groups, donors, international partners and the general public.

The UNEP Governing Council (GC. 19/17) requested that the function of UNEP/DEDC-PAC be maintained as a global centre of excellence on desertification control, promoting cooperation and the coordination of worldwide efforts to combat desertification, and advised UNEP to concentrate its efforts on the following:

(a) The development, jointly with partners, of appropriate indicators on land use and quality as part of an updated assessment methodology for drylands and desertification control;

(b) Increasing awareness of desertification and drought issues, and disseminating targeted information materials to a broad range of media and the public;

(c) Continuing to contribute to the implementation of the Convention and intensifying support for activities in Africa, Asia, Latin America and the Caribbean, at all levels, particularly in the preparation of national, sub-regional and regional action programmes.

One of the main aims of the bi-annual Desertification Control Bulletin is to disseminate information on, knowledge of, desertification problems and to present news about the programmes, activities and achievements in the implementation of the CCD around the world. Articles published in the *Desertification Control Bulletin* do not imply the expression of any opinion on the part of UNEP concerning the legal status of any country, territory, city or area, or its authorities, or concerning the delimitation of its frontiers or boundaries.

 Enquiries should be addressed to:

The Technical Advisor
Desertification Control Bulletin,
UNEP,
P.O. Box 30552,
Nairobi, Kenya

Cover Photographs

The Editor of *Desertification Control Bulletin* is seeking photographs for consideration as bulletin covers. All submissions should be addressed to the editor at the above address.

Technical requirements

Photographs must be colour transparencies of subjects related directly to desertification, land, animals, human beings, structures affected by desertification, control of desertification, reclamation of desertified lands, etc. Submissions must be of high quality to be enlarged to accommodate a square 18 cm x 18 cm (8 in x 8 in).

Captions

A brief caption must accompany each photograph giving a description of the subject, place and country, date of photograph and name and address of photographer.

Copyright

It is assumed that all submissions are the original of the photographer and all the rights are owned by the photographer. *Desertification Control Bulletin* gives full credit to photographers for the covers selected but does not provide remuneration.

Articles

Desertification Control Bulletin invites articles from the world's scientists and specialists interested in the problems arising from or associated with the spread of desertification.

Audience

The bulletin addresses a large audience which includes decision makers, planners, administrators, specialists and technicians of countries facing desertification problems, as well as all others interested in arresting the spread of desertification.

Language

The bulletin is published in English and Spanish. All manuscripts for publication must be in English.

Manuscript preparation

Manuscripts should be clearly typewritten with double spacing and wide margins, on one side of the page only. The title of the manuscript, with the author's name and address, should be given in the upper half of the first page and the number of words in the main text should appear in the upper right corner. Subsequent pages should have only the author's name in the upper right hand corner. Users of word-processors are welcome to submit their articles on diskette in MS-DOS format, indicating the programme used.

Metric system

All measurements should be in the metric system.

Tables

Each table should be typed on a separate page, should have a title and should be numbered to correspond to its point in the text. Only essential tables should be included and all should be identified as to source.

Illustrations and photographs

Line drawings of any kind should each be on a separate page drawn in black china ink and double or larger than the size to appear in the bulletin. They should never be pasted in the text. They should be as clear and as simple as possible.

Photographs in the bulletin are printed black and white. For satisfactory results, high quality black and white prints 18 cm x 24 cm (8 in x 10 in) on glossy paper are essential. Diapositive slides of high quality may be accepted; however, their quality when printed black and white in the bulletin cannot be guaranteed.

All line drawings and photographs should be numbered in one sequence to correspond to their point of reference in the text, and their descriptions should be listed on a separate page.

Footnotes and references

Footnotes and references should be listed on separate pages at the end of the manuscript. Footnotes should be kept to an absolute minimum. References should be strictly relevant to the article and should also be kept to a minimum. The style of references should follow the format common for scientific and technical publications; the last name(s) of the author(s) (each), followed by his/her initials, year of publication, title, publisher (or journal), serial number and number of pages.

Other requirements

Desertification Control Bulletin publishes original articles which have not appeared in other publications. However, reprints providing the possibility of exchange of views and developments of basic importance in desertification control among the developing regions of the world, or translations from languages of limited audiences, are not ruled out. Short reviews introducing recently published books in the subjects relevant to desertification and of interest to the readers of the bulletin are also accepted. Medium-length articles of about 3,000 words are preferred.

Editor:
Naomi Poulton
IPA,UNEP

Technical advisor:
Leonid Kroumkatchev,
DEDC/PAC, UNEP

Layout:
Enid Ngaira IPA,UNEP

Editorial:

Improved Science for Avoiding Conflict

Pick up a newspaper in any drylands country and there is likely to be a story about conflict over land, or "cattle rustling", or disputes between farmers and pastoralists, or "banditry" or even "foreign terrorists". These are problems which are often founded on conflicts over dwindling resources and desertification.

Desertification is land degradation in the drylands. This degradation may take several forms - physical loss through erosion or productivity loss through the depletion of nutrients. Once the degradation reaches a critical point, however, the land can no longer be used to sustain life and has to be left to recover its productivity over a period of years; or if the degradation is severe enough, abandoned.

The families that were sustained by the land have to move to find other sources of sustenance. There is a recognizable sequence of events that can ensue. Loss of land productivity, abandonment of land, displacement of people, consolidation of families, increased pressure on family lands, increased family stress, further loss of productivity; migration to new (probably less suitable) lands; increased social tension, leading to civil strife; increased competition among users; cattle rustling; crop stealing; further loss of productivity; further migration; cross-border migration, the creation of refugees; increased cultural and social problems; politics becoming a major issue; inter-tribal or inter cultural differences exacerbated; international tension and accusations increase, all leading dangerously towards civil unrest and international skirmishing or war.

All of these events, except perhaps the very last, are going on at present in drylands throughout the world. The struggle for survival and the need for land to sustain people is not the only cause of these events, but it is by far the most significant. The essentials for life are clean water, food, shelter and health. Access to land for food, shelter and water is fundamental. Conflicts over access to resources are increasing as populations grow and resources are degraded or depleted.

It is easy to say that these events are inevitable or are far away and "not our problem". But the world is becoming more closely knit; events in one part of the world have increasing reverberations on the other side of the globe. Mass movements of people, such as recently in the Great Lakes area of Africa, are of global concern. Humanitarian relief efforts are increasing - but is there more that could be done preventively?

Clearly events within countries are the business only of that nation. But when the events spill over into adjacent countries, the raising of international concern becomes legitimate and calls for international action to ameliorate the suffering that may arise. But could more be done? After all, the possible sequence of events resulting from land degradation is fairly clear (and there are other causes leading to the same ends). The question is: Is there a role for science in better documenting the causes and effects and the linkages between them? I believe there is.

According to recent estimates by Norman Myers there were some 57 million displaced people worldwide in 1994 of whom some 27 million had crossed international boundaries and were therefore officially refugees. The rest were displaced within their own countries. About 15 million of these were estimated to be "environmental refugees", but these figures are very conjectural estimates. Much more needs to be done to determine scientifically the "push" factors that mobilize migrants, especially in relation to the scarcity of natural resources. The Food and Agriculture Organization of the United Nations estimates that there are 841 million people on the verge of starvation, in the developing countries alone. That is 20 per cent of the population are chronically undernourished, in many cases because of lack of access to productive land to sustain them. Lacking access to land on which to sustain themselves, those that are strong enough may well migrate and so enter the chain of events outlined above. They may then pose a threat to stability and even security in their own countries and perhaps adjacent ones.

Unfortunately this path to conflict, this threat to security, is based largely on empirical evidence, on scattered reports, on non-specific documentation, on official reporting (usually conservative) and media reporting (often alarmist) and there is little hard scientific data to confirm what is going on, let alone predict what will develop next.

This could be different. There is wide scope and need for improved information on the physical sciences involved in monitoring land degradation. And there is much more information needed on the social science side determining the causes, extent and effects of land degradation. Just getting a better knowledge of the numbers of migrants, and even of refugees and the root causes of their forced migration, would help advance the science.

UNEP is preparing the second edition of the World Atlas of Desertification to be published in September 1997 by Edward Arnold. This is an extensively updated and revised atlas, but one of the lessons drawn from its preparation is that there is still much more data needed before we can claim to have fully defined the global desertification problem.

There is work going on in both the physical and social sciences, but much, much more needs to be done to evaluate the linkages and help prevent this growing threat to security as an ever increasing population has access to less and less productive land. UNEP, with its United Nations partners has been taking steps in this direction. We are working with partners such as the World Bank, UNDP, FAO, the CCD Secretariat and others on the development of land quality indicators, on indicators of desertification and methods to assess the progress of implementation of the Convention to Combat Desertification. We are holding workshops and seeking new partners to address these issues. We believe that the essence of sustainable environment management is the avoidance of conflict. But we can only encourage action - we have minimal resources to make it happen.

During the cold war, vast sums were spent by the major protagonists on measures to predict and avoid conflict as well as to prepare for it and deal with it where necessary. Such willingness to pay for preventive action, for accurate information and preventative planning, has not for some reason been widely adopted outside military establishments. We still think that because environmental threats are not clearly defined, sometimes slow to develop, and "may not happen anyway", we can muddle through and deal with them when we have to.

There is a growing recognition that environmental threats are increasing and beginning to coalesce. They increasingly interact with our daily lives and they require substantial effort to overcome. The daily subjective evidence from the drylands should surely be enough to confirm the need for improved physical and social science assessments. With an improved scientific information base it would be possible to improve the planning for avoiding situations that could develop, and also to ensure that solutions to situations that arise - such as an influx of refugees, can be handled in a more satisfactory manner. Such a programme of support to countries to improve the science base of their environmental emergency planning would have benefits far beyond the immediate objective.

When the Conference of the Parties to the Convention on Combating Desertification meets first in Rome in October 1997, let us hope that they will recognize this need and give strong support to the Committee on Science and Technology. With the weight of the Convention behind them there should be greater attention and funding given to the science of conflict avoidance in the drylands, being carried out by an increasing network of scientific institutions worldwide, actively encouraged by UNEP.

W. Franklin G. Cardy
Executive Coordinator
Natural Resources and Director, Land

Summary of the tenth session of the Intergovernmental Negotiating Committee for the Convention to Combat Desertification[1]

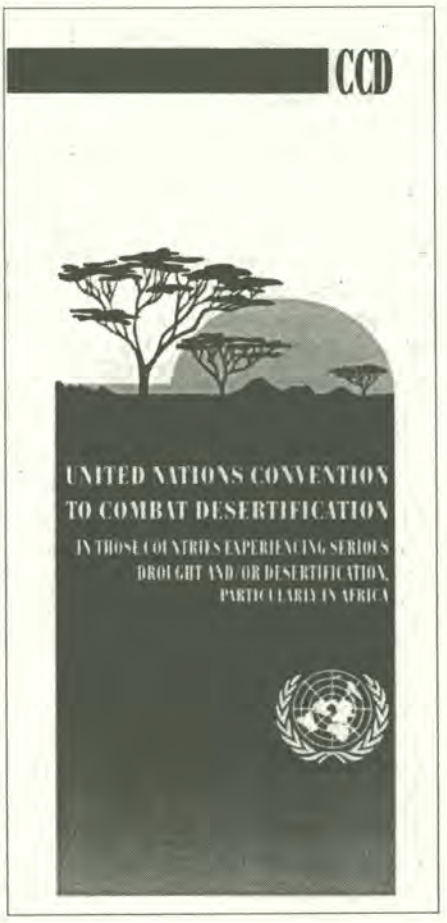
6 to 17 January 1997

The Intergovernmental Negotiating Committee for the Convention to Combat Desertification (INCD) met for its tenth session at United Nations Headquarters in New York, from 6 to 17 January 1997. This was the last scheduled session before the first Conference of the Parties (COP-1), which will be held from 29 September to 10 October 1997 in Rome. At the end of the session, however, delegates felt it was necessary to hold a resumed session of INCD-10 from 18 to 22 August 1997, in Geneva, to address technical issues related to outstanding arrangements for COP-1.

INCD-10 was devoted to the preparation of COP-1. Although most delegates were pleased with the progress made at this session, some participants sensed a certain ambivalence. The sense of urgency that the coming into force of the Convention to Combat Desertification (CCD) on 26 December 1996 should have brought about was absent. Key issues, such as functions of the institutions to host the Global Mechanism, the physical location of the Permanent Secretariat and the size and composition of the COP Bureau, were passed on to the COP.

A brief history of the INCD

The Convention to Combat Desertification (CCD) was adopted on 17 June 1994, and opened for signature in Paris on 14 and 15 October 1994. The Convention entered into force on 26 December 1996. The CCD takes an innovative approach in recognizing: the physical, biological and socio-economic aspects of desertification; the importance of redirecting technology transfer so that it is demand driven; and the involvement of local populations in the development of national action programmes. The core of the Convention is the development of national and sub-regional/regional action programmes by national governments in cooperation with donors, local populations and non-governmental organizations (NGOs).



Negotiation of the Convention

During its 47th session in 1992, the United Nations General Assembly, as requested by the United Nations Conference on

[1]This report was compiled from the special issue of Earth Negotiations Bulletin published by the International Institute for Sustainable Development (IISD). This report is printed without prejudice and in the understanding that any views expressed herein are not necessarily those of UNEP.

Environment and Development (UNCED), adopted resolution 47/188 calling for the establishment of the INCD. At the organizational session of the INCD in January 1993, delegates elected Bo Kjellén (Sweden) Chair of the Committee. The INCD met five times between May 1993 and June 1994, during which delegates drafted the Convention and four regional implementation annexes for Africa, Asia, Latin America and the Caribbean, and the Northern Mediterranean. The Convention was adopted on the closing day of INCD-5 in Paris, along with resolutions recommending urgent action for Africa and interim arrangements for the period between adoption of the CCD and its entry into force.

Post-agreement negotiations

INCD-6 was held in New York from 9 to 18 January 1995. The Committee reached agreement on its work programme for the interim period and the mandates of the two Working Groups and the Plenary. Delegates at INCD-7, which took place in Nairobi from 7 to 17 August 1995, reviewed the status of ratification and implementation of the Resolution on Urgent Action for Africa and Interim Measures. The Committee discussed and provided input on the structure and elements that should be considered in preparation for COP-1.

INCD-8, held from 5 to 15 February 1996 in Geneva, reviewed the status of ratifications and the implementation of the Resolution on Urgent Action for Africa and Interim Measures. The Committee began negotiations on some of the Secretariat's texts on preparations for COP-1. Delegates requested the Secretariat to prepare new texts for negotiation at INCD-9, based on their discussions and on the programme and budget for INCD-10. Some delegations revisited the question raised at INCD-7 regarding the need for two-week sessions of the Committee in the future.

INCD-9 was held in New York from 3 to 13 September 1996. During this session, the working groups continued to prepare for COP-1. Delegates addressed outstanding issues related to preparation for COP-1, except for programme and budget. The delegates felt that good progress was made, especially concerning scientific and technological cooperation, although several of the most important, primarily financial, issues remained unresolved.

Report of the tenth session

Monday, 6 January 1997, marked the beginning of the tenth session of the Committee. It was the INCD's first meeting since the Convention came into force and the last scheduled meeting prior to the first Conference of the Parties, which will take place from 29 September to 10 October 1997 in Rome, Italy. At the conclusion of the two-week session, delegates agreed to resume INCD-10 for five days in August 1997 in Geneva.

The INCD-10 agenda included preparations for the first Conference of the Parties on the following issues: physical location and administrative arrangements for the Permanent Secretariat; the Global Mechanism; financial rules; programme and budget; rules of procedure; and scientific and technical cooperation.

Plenary

INCD Chair Bo Kjellén (Sweden) opened the session on Monday morning, 6 January 1997. He noted with satisfaction that the Convention had entered into force since the last INCD session. The programme of work and agenda (A/AC.241/62) were adopted. The Plenary was then adjourned until Tuesday afternoon so that regional groups could meet. When the Plenary reconvened, Under-Secretary-General Nitin Desai, United Nations Department of Policy Coordination and Sustainable Development, said that the CCD deals with core development issues, provides the opportunity to integrate environment and development at the point at which action takes place, and provides a test case of our capacity to implement the ambitious programmes that are negotiated at the international level.

Chair Kjellén noted that the CCD had entered into force on 26 December 1996, 90 days after the 50th ratification by Chad. He noted that the central issues at this session were: the functioning and host organization of the Global Mechanism; the work programme, budget and role of the Permanent Secretariat; and the possibility of the Committee on Science and Technology (CST) to meet in conjunction with COP-1. Kjellén pointed out the link between the INCD process and the meeting of the commission on sustainable development in April, and the United Nations special session of the General Assembly for review of the implementation of Agenda 21, to be held in June.

Salif Diallo, Minister of Environment and Water of Burkina Faso, noted that action in Africa had been slow, but said that African ministries were committed to implementing the CCD. He urged developed countries to raise awareness about the CCD and called for the realization of the spirit of partnership in the Convention. He also highlighted the importance of the Global Mechanism. Without it, the CCD would lose its innovative character and sisterhood with the Conventions on Biodiversity and Climate Change.

A brief analysis of INCD-10

Many INCD-10 participants suggested that the end of this session marks the beginning of the implementation of the United Nations Convention to Combat Desertification, with the first meeting of the Conference of the Parties (COP-1) only eight months away. In spite of the difficulty encountered in negotiating the Global Mechanism, many delegates felt the issue prompted them to reflect more critically on the crucial elements needed for the effective implementation of the Convention. Several delegates emphasized three aspects that they consider the foundation of the Convention: partnership, participation and resources. Delegates also reflected on decisions taken on scientific and technological

cooperation, as well as those that will be taken at COP-1.

Partnership and Partnership Building: Most delegates agree that partnership, as called for in the Convention, is the most significant accomplishment of the CCD. One delegate called it "the magic word". The spirit with which this Convention was negotiated demonstrates that if good projects are prepared, funds will be made available. A delegate argued that, assuming no additional funds were made available, implementing the Convention can make a significant difference if the funds presently allocated to desertification and drought activities are re-directed. However, delegates also expressed caution on the need to recognize that partnership, which is also often referred to as coordination, will be constrained by certain factors.

The Convention alludes to three forms of coordination: between the countries in the South; between developing and developed countries; and with other Conventions. Combating desertification on a small scale will have no effect. Partnership among developing countries is therefore essential, but they may find it difficult to coordinate their work because it will require improved relations on other levels. Coordination between donors will require the North to move away from the political meaning of coordination, which is viewed as a way to exercise power. Collaboration between the three Rio Conventions is necessary to ensure that they are all focused on sustainable development objectives.

Another concern is the difficulty of building partnerships between groups that have very different interests, which could easily degenerate into a battlefield. The discussion on the Global Mechanism reflected this tension.

Participation: Many delegates agreed that the most innovative aspect of the Convention is the recommendation for the involvement of civil society. If affected governments make genuine efforts to ensure the participation of affected populations, the impact will not only be great but there will be a real incentive for developed countries to provide resources. However, problems may arise from a number of sources.

First, the transformation in the lives of the people in the drylands will not be immediate. It will take time to convince development agencies that dryland development is not just about soil conservation and that drylands have economic value. Second, patience is a necessary element for genuine participation to take place. Third, different players in the Convention have different views about what participation is all about. The perception of participation among governments in the South differs from that in the North. These differences must be clearly understood.

Some NGOs were critical of their role in the process of participation in policy-making. They argued that if they were facing obstacles in the "NGO-friendly" INCD process, the constraints for communities and local populations would be multiplied. As in many other intergovernmental processes, NGOs were allowed to make interventions just before the close of INCD-10 meetings, often after the issues they intended to raise had been discussed and decisions taken. However, some countries have made remarkable progress. Some developing countries now have NGOs on their delegations and in one country, an NGO is the convener of the national coordinating committee. In many others, NGOs are involved in the national steering committees and desertification funds.

Financial resources, a legitimate concern?: Apart from the lack of passion with which the subject was negotiated, the discussion on the function of mobilizing financial resources was reminiscent of the discussion on the Global Mechanism at INCD-5. While the core group was embroiled in discussions on whether or not the Mechanism will have resources of its own to fund the implementation of projects or programmes, most delegates thought the more important issue was whether there will be any resources at all, irrespective of the process of mobilization.

Many argued that donors have demonstrated during the interim period that resources will be available if affected countries can practically demonstrate their political will and develop projects within the provisions of the Convention. However, most NGOs doubted that they would be able to access funds, in particular at the national and regional levels, for activities that are within their area of competence. This concern was confirmed during the interim period. They called for a workable mechanism to be put in place.

For some delegates, underlying the debate on financial resources was the fundamental question of development assistance. The debate displayed the long standing tensions on development assistance that are also evident in other Rio Conventions. The Convention provides developing countries, in particular those in Africa, with the opportunity to alter the game on the bilateral and multi-lateral level, not through empowering the Global Mechanism to mobilize resources, but through the emerging concept of chef-de-file.

The delay in reaching agreement on this function caused some to speculate that it was a strategy to ensure that the COP would vote on this decision. Some developed country delegates expressed concern that they had convinced their governments to ratify the Convention because the GM would not be an institution that finances the implementation of programmes and projects, a position that is now being challenged.

Nevertheless, most delegates agreed that the matter, as a political issue, can only be resolved at the political level at COP-1. A few disagreed, noting that delaying important decisions, including what character the Global Mechanism assumes and the country that hosts the Permanent Secretariat, will hold the implementation of the Convention hostage. This delay could result in some of the institutions involved in overseeing the implementation starting operations as late as 1999.

The overall impression of the INCD process thus far is that developing countries may have been too optimistic in their hopes for additional development assistance through this Convention. On the other hand, some donors had initially assumed they could provide such resources, but the economic recession

has created social situations that deeply affect their foreign policies, leading to decreases in development assistance. This has resulted in a magnified North-South tug-of-war on financial issues during the critical stages of the negotiations. Some feel that the solution to this problem is to take what is there and make the best of it. Developing countries need to understand that more funds may not be forthcoming and developed countries need to recognize that it is difficult for developing countries to demonstrate commitment and results if they lack the necessary resources for implementation. The Convention may also ensure that further cuts in official development assistance, in particular for dryland areas, are curtailed.

Practical solutions needed in the CST: Although steady progress has been made since the start of discussions on scientific and technological cooperation, some delegates questioned the value of spending so much time discussing institutions and networking. First, information requested from the institutions on the projects and activities they are undertaking will take a long time to compile and, by the time it is ready, be out of date. Second, institutions are often reluctant to provide this type of information. The first priority of the CST is to survey and identify networks between existing organizations.

Some sensed a deficiency in the discussions dealing with the more practical aspects of implementation that relate to the "science of ensuring participation". They argued that although this constraint emanates from a lack of methodologies providing a logical process that would culminate in local populations assuming ownership of the Convention, consideration of provisions to learn from success stories and experiences of local populations would be useful.

From negotiation to implementation: When INCD Chair Kjellén concluded the session, he emphasized that, despite the fact that this phase of the negotiations has focused on words, the core of the Convention really deals with people in the drylands and the improvement of their condition. Some participants suggested that, despite the Chair's assurances, the link between the macro and micro levels was weak.

An example of where delegates seem to have lost focus on the core issue in the Convention is the negotiations in Working Group II on rules of procedure. The amount of time spent on the size and composition of the Bureau seemed disproportionate to the impact it will have on the outcome of this process. This was also one of the outstanding issues that led to the need for a resumed tenth session. Some said it was a question primarily for professional diplomats who have negotiated similar issues in the context of other conventions and who lack first-hand knowledge about the activities and conditions in the field.

The numerous criteria required for the composition of bodies working with science and technology is also a source of tension. While there is a preference for small groups to achieve efficiency, the requirements to ensure a fair representation of all interest groups will be difficult to reconcile. This difficulty led several to believe that ad hoc panels were not likely to be established any time soon. Scientific ad hoc panels in the Biodiversity and Climate Change Conventions have not been set up. NGOs recognized this fact and, in an attempt to make a contribution to the first CST session, proposed an open-ended consultative group to study local area development.

The Convention entered into force on 26 December 1996, and will now be implemented. The Convention is described as innovative because it supports the bottom-up approach. However, the whole negotiation process is itself an example of a top-down process and in the implementation of the Convention, local populations will still have to be convinced the Convention will benefit them.

Most delegates re-affirmed the need for the involvement of all actors. NGOs and their international network, Réseau international d'ONG sur la désertification (RIOD), have an important role to play linking the macro and micro levels. The affected country Parties have to ensure the necessary enabling, and policy environment. Donors have to provide and assure better coordination of their resources. These are the lessons the interim measures and the urgent action for Africa have demonstrated, in addition to the need to maintain the momentum of a Convention that still seems to lack a high political profile. This momentum should enable a smooth transition into the post COP-1 implementation period.

UNEP Governing Council 19th Session

27 January - 7 February 1997
Decision 19/17 - Desertification

The Governing Council is the governing body of UNEP. It is composed of 58 members of the United Nations General Assembly, with due regard to the geographical representation of its membership, who direct and monitor UNEP's work. Membership of the Governing Council rotates every four years to allow all Member States to play an active role. The Governing Council meets at UNEP headquarters in Nairobi at least every two years in order to approve the programme of work for the forthcoming biennium. Special sessions of the Governing Council may also be called with the agreement of the Governing Council Member States. The Governing Council is an integral part of the United Nations Secretariat and reports back to the United Nations General Assembly through the United Nations Economic and Social Council.

The Governing Council devoted considerable time to negotiation of the decision on desertification (below) indicating the raised level of political interest in the issue. At the high level session, the countries affected by desertification made many favourable references to the work UNEP has been doing in supporting them and in assisting the progress of the Convention to Combat Desertification.

However, the results of the discussions in the budget review meetings were that the final allocations of the budget for 1998-1999 to the Land programme (which includes desertification along with agriculture and soils) was only 6.5 per cent of the total environment fund budget. This is down from about 12 per cent in 1995, 9 per cent in 1996 and about 7.5 per cent this year. Since the overall size of the environment fund has also dropped over these years, there will be much less left in the environment fund's Land budget to support activities in the field. Staff will have to mobilize additional resources for the approved activities.

The Governing Council, Having considered the report of the Executive Director on the effort of the United Nations Environment Programme towards the implementation of the United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, particularly in Africa: 1995-1996 (UNEP/GC.19/7),

1. **Welcomes** the entry into force of the Convention on 26 December 1996 and urges all States that have not yet ratified the Convention to do so, in order to be in a position to participate as parties in the first session of the Conference of the Parties, to be held in Rome from 29 September to 10 October 1997, and highlights the importance of the second session of the Conference of the Parties being held in Africa;
2. **Expresses its support** for ongoing efforts by the United Nations Environment Programme to develop jointly with its partners appropriate indicators on land use and quality as part of an updated assessment methodology for drylands and desertification and invites the United Nations Environment Programme to contribute, within the framework of the informal open-end consultative process established by the Intergovernmental Negotiating Committee for the Elaboration of an International Convention to Combat Desertification in those Countries experiencing Serious Drought and/or Desertification, particularly in Africa, to the elaboration of benchmarks and indicators to measure progress in the implementation of the Convention, as well as to the development of a methodology for determining impact indicators;
3. **Further expresses its support** for the Programme's efforts to increase awareness of desertification and drought issues and disseminate targeted information materials to a broad range of media and the public;
4. **Requests** the Executive Director to maintain the function of the

United Nations Environment Programme as a global centre of excellence on desertification control, promoting cooperation and coordination of worldwide efforts to combat desertification and/or to mitigate the effects of drought and to continue and intensify research and development collaboration with leading world scientific institutions and centres of excellence on desertification and land degradation and drought issues, particularly on the social and economic aspects of these problems, in accordance with the approved programme of work for the biennium 1998-1999;

5. **Also requests** the Executive Director to participate actively in assisting governments and non-governmental and community-based organizations to implement the Convention to Combat Desertification and the resolution on urgent action for Africa adopted by the Intergovernmental Negotiating Committee and to support, in accordance with the approved programme of work for the biennium 1998-1999, the Permanent Secretariat of the Convention;
6. **Takes note** of the decision of the Intergovernmental Negotiating Committee to accept the offer of the Secretary-General of the United Nations to provide the administrative and support arrangements for the Convention Secretariat and invites the United Nations Environment Programme to collaborate with the Executive Secretary of the Convention in reaching understandings that specify the nature of the cooperation and support that it would provide to the Permanent Secretariat;
7. **Takes note also** that 31 May 1996 was the deadline for the official presentation of candidatures offering to host the Permanent Secretariat of the Convention and that by that date offers had been received from Canada, Germany and Spain to host the Permanent Secretariat at Montreal, Bonn and Murcia, respectively (A/AC.241/54/Add.1, Add.2 and Add.3), with the decision on the location of the headquarters of the Secretariat to be taken by the Conference of the Parties at its first session;
8. **Authorizes** the Executive Director to submit, on behalf of the Council, her report on the efforts of the United Nations Environment Programme towards the implementation of the Convention in 1995 and 1996, through the Commission on Sustainable Development at its fifth session, to be held from 7 to 25 April 1997, and the Conference of the Parties to the Convention, at its first session, to the General Assembly at its fifty-second session;
9. **Encourages** the Executive Director:
   (a) To continue to contribute, in accordance with the approved programmes of work for the bienniums 1996-1997 and 1998-1999, to the implementation of the Convention and resolution 5/1 on urgent action for Africa, adopted by the Intergovernmental Negotiating Committee on 17 June 1994, on the basis of the resources provided for under programme activities to implement chapter 12 of Agenda 21 in the developing countries, in particular in Africa, in Asia and in Latin America and the Caribbean, in close collaboration with the Permanent Secretariat of the Convention;
   (b) To invite other organizations and agencies of the United Nations system, financial institutions, funds and other interested parties to participate in the formulation and conclusion of partnership agreements or arrangements for the implementation of the Convention at all levels in affected developing countries, particularly in Africa;
   (c) To continue to support activities related to capacity-building and appropriate coordinating mechanisms at the national, subregional and regional levels;
   (d) To intensify support for activities in Africa, Asia and Latin America and the Caribbean, at all levels, particularly in the preparation of national, subregional and regional action programmes through the United Nations Environment Programme regional offices for Africa, Asia and Latin America and the Caribbean;
10. **Urge** governments to provide the Conference of the Parties through the Permanent Secretariat of the Convention relevant research and up-to-date data on the status of desertification and land degradation at the national level for the consideration of the Committee on Science and Technology of the Convention;
11. **Calls upon** governments, regional economic integration organizations and other interested organizations, as well as non-governmental organizations, to make further contributions for the implementation of the Convention in affected developing countries, particularly in Africa, Asia and Latin America and the Caribbean.

Linkages Between Dryland Degradation and Migration: A Methodology

Daniel Stiles

2066 Terrabonne
San Dimas, CA 91773
USA

Introduction

Human displacements, either temporary or long-lasting, are becoming a dominant feature of the end of the twentieth century. Migrations and transhumant movements have been a normal part of human history, but the scale of various types of migration, whether voluntary or involuntary, have reached unprecedented levels. The United Nations Population Fund has called migration the human crisis of our age (UNFPA, 1993:15).

One important category of migrant today is the type which is pushed to leave a rural area due to environmental degradation (Jacobson, 1988, 1989; IOM/RPG, 1992; Trolldalen, 1993; Trolldalen et al., 1992; Myers, 1995). This article attempts to define and analyze issues related to environmentally-induced migration within the broader context of migration in general. It focuses specifically on the interrelationships of dryland degradation, also called desertification, with other environmental, economic and social variables that influence migration patterns, and it puts forth definitions and a methodology by which environmental migration can be studied.

International migrants and refugees make up a total of about 125 million people (United Nations, 1994). In addition, in 1995 there were internally displaced persons numbering approximately 27 million people (Kane, 1995:134). The World Bank (1994) estimates that there are roughly 70 million additional people currently displaced involuntarily by development projects worldwide, and that 10 million new people are so displaced every year. International migration and involuntarily internally displaced people, therefore, amount to between 197 and 222 million people, 3.4 per cent to 3.9 per cent of the world's 5.7 billion population (Table 1).

There are no comprehensive data for internal voluntary migrants, but urban growth rates compared to rural rates since 1965 indicate that there has been substantial rural-urban migration (WRI, 1994: table 17.2). When combined with other internal migration, this category certainly exceeds the sum of all types of international migration by a great margin (Kane, 1995). The United Nations Expert Group Meeting on Population Distribution and Migration estimated that net internal migration of all types involved between 750 million and one billion persons during the period 1975-1985 (United Nations, 1993:122).

Environmental degradation and migration are increasingly being linked to issues of national and international security and stability (Loescher, 1992; Suliman, 1992; Westing, 1994; Widgren, 1990; Homer-Dixon, 1993). In what the Worldwatch Institute calls the "Molotov Cocktail of insecurity", migration is increasingly being caused by ancient ethnic animosities exacerbated by resource scarcities and population growth (Kane, 1995:139).

Table 1.
Number of people who have left their place of origin.

Category	Number (millions)
International migrants	100
Refugees	25
Internally displaced	27
Displaced by development	70
Internal migrants	1000 ?

Definitions

There are three broad areas where defining terms are necessary: (1) categories of migration and the people who migrate; (2) dryland and dryland areas; and (3) land degradation.

Migration and migrants

There have been many discussions of definitions related to population movements, but no universally accepted taxonomy has been formulated. A system of classification to be workable should be able to include all cases and the criteria be readily applicable to all cases. An internationally agreed upon, and workable, migrant taxonomy is needed in order to define the responsibilities and obligations of governments and institutions involved with population movements.

United Nations Convention Relating to the Status of Refugees

This Convention, adopted in 1951 in the aftermath of World War II, defines "refugee" as follows:

> For the purposes of the present Convention, the term "refugee" shall apply to any person who as a result of events occurring before 1 January 1951 and owing to well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the country of his nationality and is unable or, owing to such fear, unwilling to avail himself of the protection of that country.

The legal definition of a refugee is very narrow and applies only to those outside their own country and who fear persecution there. People who fear persecution within their own country and who remain there, and those who leave their homes, whether internal or cross-border, due to warfare, political instability and conflict (not involving specific persecution), natural disasters or severe economic/subsistence stress are not covered.

In all definitions of refugee, a key legal point is the relationship of the migrant with his/her government. A refugee is always in need of protection, as the government either can not or will not provide it, but he/she is only sometimes also in need of assistance in order to survive. In terms of the existing legal definitions, the economic situation of a refugee is irrelevant.

El-Hinnawi, 1985

UNEP sponsored a report that defined and highlighted a new category of refugee, the "environmental refugee" (El-Hinnawi, 1985). The report noted that there had been an increase in the number and scale of natural disasters in the 1970s compared with previous periods, and that environmental problems of various kinds were resulting in increased human deaths, health problems and forced displacements. The UNEP report defined environmental refugees as:

> Those people who have been forced to leave their traditional habitat, temporarily or permanently, because of a marked environmental disruption (natural and/or triggered by people) that jeopardized their existence and/or seriously affected the quality of their life. By "environmental disruption" in this definition is meant any physical, chemical and/or biological changes in the ecosystem (or the resource base) that render it, temporarily or permanently, unsuitable to support human life (El-Hinnawi, 1985:4).

People displaced for political reasons or by civil strife or economic reasons were not considered to be environmental refugees.

Jacobson, 1988

Jacobson of the Worldwatch Institute defined environmental refugees as: (1) Those people temporarily displaced due to a local environmental disruption; (2) those who migrate because environmental degradation has undermined their livelihood or poses unacceptable risks to health; and (3) those who resettle because land degradation has resulted in desertification or because of other permanent changes in habitat." She further states that "environmental refugees have become the single largest class of displaced persons in the world" and that the third type defined above is the largest and fastest growing category (Jacobson, 1989:39). Land degradation is said to be the cause of at least 10 million "refugees" (Jacobson, 1989:39), and that it will continue to be the major environmental cause of migration until sea-level rise overtakes it. Land degradation is assumed to be linked to a reduction in the ability of ecosystems to support life, the "carrying capacity" of the land.

Jacobson's environmental refugee categories are similar to El-Hinnawi's. As with the UNEP report, the Worldwatch approach argues that environmental refugees should be a recognized category by the international community, but no suggestion is made as to how this might come about.

IOM/RPG, 1992

The International Organization for Migration and the Refugee Policy Group report recognized six major causes and types of environmental migration: elemental disruptions, biological disruptions, slow-onset disruptions, accidental disruptions, disruptions caused by development, and environmental warfare.

The IOM/RPG report distinguished types of movement that cross-cut the above six categories of migration: small or large scale; emergency versus slow-onset; temporary, extended and permanent; and internal or international. The cause of migration and type of movement determines the type of assistance and/or protection that is needed for the affected people. The IOM/RPG (1992:22) report states that the definition of "environmental refugee" proposed by El-Hinnawi (1985) is not precise enough because it does not address the issue of different categories of migrants being eligible for different types of assistance under various international and national mandates and laws.

The IOM/RPG (1992:24) report distinguishes "environmental refugees" from "environmental migrants". Either can be internal or cross-border, but the report skirts the legal issues involved and does not suggest how the current incompatibility with international law can be overcome. The report suggests, however, that migration policies and arrangements need to be adapted to deal with the various types of environmental migration. The distinction between "environmental refugee" and "environmental migrant" follows the 1951 Convention in that the former requires both assistance and protection, while the latter requires assistance only. It is incompatible with the Convention in that it includes internally displaced people in the category "refugee".

Trolldalen et al., 1992

As with the IOM/RPG report, this report sees a primary distinction between coerced or forced migration, and voluntary migration. The former migrants are in need of protection as well as assistance. It differs with IOM/RPG and UNEP, however, in that it restricts its definition of environmental refugees to cross-border migrants to remain consistent with the 1951 Convention. Trolldalen et al. (1992:5) state explicitly that the category environmental refugee only supplements the definition of refugee in the 1951 Convention and that it does not compromise the status and standing of refugees defined under the Convention. The term "environmental refugee", therefore, should refer to persons who are forced or coerced to leave their homes for environmental reasons that threaten their lives, and who leave their country of origin or nationality.

Appleyard, 1991

This report focused almost exclusively on the economic reasons for migration and labour transfers, though it also evoked demographic pressures as an important push factor in the South under contemporary conditions. The major pull factor to the North (i.e. OECD countries) was assumed to be the positive economic differential between it and the South (i.e. the so-called developing countries), though these economic differentials also existed in some South-South migration patterns.

Six major categories of international migrant are defined in the IOM report (Appleyard, 1991:22-23). The categories are: **Permanent settlers**, people who migrate legally to live and work in another country, including persons admitted under family reunion schemes; **Temporary contract workers**, who are normally unskilled or semi-skilled labour and who work for a contract period and return home; **Temporary professionals**, who usually work for multi-national companies or educational institutions; **Illegal workers**, who immigrate to a country illegally or overstay their visa. They might not always be employed, however, and **illegal immigrant** can be suggested as a better term. They could be either temporary or long-lasting; **Asylum-seekers**, who cross borders and claim refugee status on the grounds of persecution and fear for their lives; **Refugees**, as defined by the 1951 Convention.

Myers, 1995

In a comprehensive report for the Climate Institute of the United States of America, Myers (1995) has defined environmental refugees as:

> Persons who can no longer gain a secure livelihood in their traditional homelands because of what are primarily environmental factors of unusual scope. These factors include drought, desertification, de-forestation, soil erosion and other forms of land degradation; resource deficits such as water shortages; decline of urban habitats through massive over-loading of city systems; emergent problems such as climate change, especially global warming; and natural disasters such as cyclones, storm surges and floods, also earthquakes, with impacts aggravated by human mismanagement. There can be additional factors that exacerbate environmental problems and that often derive in part from environmental problems: population growth, widespread poverty, famine and pandemic disease. Still further factors include deficient development policies and government systems that "marginalize" people in economic, political, social and legal senses . In certain circumstances, a number of factors can serve as "immediate triggers" of migration, e.g. major industrial accidents and construction of outsize dams. Of these manifold factors, several can operate in combination, often with compounded impacts. In face of environmental problems, people concerned feel they have no alternative but to seek sustenance elsewhere, either within their countries or in other countries, and whether on a semi-permanent or permanent basis.

Myers' definition includes types and causes of migration as well as non-environmental contributing and interrelated causes of migration. It is also incompatible with the 1951 Convention in that it includes internal migrants, and some people who are not in fear for their lives. It has the disadvantage of being extremely long.

Myers argues forcefully that the term "environmental refugee" should be accepted in spite of the fact that it does not accord in several respects with the 1951 Convention's definition of refugee. An analogy of sorts is made between people fleeing persecution or oppression and those fleeing an environmental disruption. Myers proposes that both should be treated in the same way by the international community.

Discussion

Given the current tightening of immigration regulations seen in many countries of the world, in both the North and the South, it seems unlikely that there will be sufficient political support for the broadening of the definition "refugee" that might give some legal or otherwise recognized right to people displaced by some type of environmental disruption, either abrupt or slow-onset, to claim assistance and/or residence in another country (UNHCR, 1991). Using the term

"refugee" for such people implies that they have such a right. The term might be an accurate description of their situation in a popular sense, as many agree, but if they do not enjoy the same rights as political refugees they should not be called by the same term.

Five criteria can be used which are fundamental in classifying all types of migration and migrants *sensu lato*: (1) internal, (2) international, (3) natural force (4) human coercion and (5) voluntary. The first two are geographical, and the last three relate to the primary motivation for movement. One of the first two is used in combination with one of the following three to arrive at a category. These five criteria can be used to classify any type of migration or category of migrant:

Internal - Movement within national borders.

International - Movement from one country to another.

Natural force - An abrupt natural, biological or chemical disaster that either threatens survival or makes survival virtually impossible, and forces people to move either temporarily or permanently. Examples are earthquakes, hurricanes/typhoons, nuclear reactor accidents, chemical plant accidents, locust plagues and temporary drought victims who will return to their land.

Human coercion - People leave their homes because of fear for their lives or of repression (e.g. imprisonment, torture, etc.). The source of the fear is human, not natural or physical. Typical examples are warfare, genocide, land-grabbing, political persecution under repressive regimes, and resettlement due to development projects or urbanization. The last example might be disputed by some, but there is abundant evidence to show that the vast majority of people displaced by "development" go unwillingly and often after beatings and intimidation of various sorts. It is important to distinguish between "forced" and "coerced" to arrive at a clear, workable taxonomy and remain consistent with international law.

Voluntary - People who have made an unforced decision to move. There is a certain arbitrariness in defining this criterion, as there are various levels of what could be called compulsion involved in "voluntary" decisions, and pull factors can also be significant. This category is typically associated with slow-onset environmental processes, as distinct from abrupt environmental disruptions seen in the "Natural force" criterion above, and it includes people who migrate purely for economic reasons.

Using these criteria the following categories can be made, shown in table 1:

There are, therefore, six basic types of people who move: (1) displaced persons, (2) repressees, (3) oustees, (4) refugees, (5) migrants and (6) asylum-seekers.

Table 2.
Categories of people who move

	Natural Force	Human Coercion	Voluntary
Internal	Displaced person	Repressee, Oustee	Migrant
International	Displaced person	Refugee, (Asylum-seeker)	Migrant, (Asylum-seeker)

"Asylum-seekers" is in parentheses in the table because they are a temporary category, and they will eventually be classified as either "refugee" or "migrant" by the receiving country. Two other descriptors that can be added to any of the categories to create sub-categories are "documented" or "undocumented", and "temporary" or "permanent".

The main categories of people who move because of dryland degradation are *migrants* and *oustees*. Oustees are included because many of the development projects that displace people are related to dryland degradation and rehabilitation and/or economic development in the drylands.

Drylands

Drylands have been defined by UNEP (1992a) using a formula based on the Thornthwaite precipitation/potential evapotranspiration (P/PET) method of calculating the Aridity Index (AI). The following dryland types were defined:

Hyper-arid	<0.05
Arid	0.05-0.20
Semi-arid	0.21-0.50
Dry sub-humid	>0.65

The surface areas by regions of these land types are shown in table 2. It should be realized that the boundaries and areas of each category are neither static nor abrupt (UNEP, 1992b:5). The definition of desertification established at UNCED and used in the Convention to Combat Desertification does not include land degradation occurring in hyper-arid or in more humid areas. Land degradation can occur world-wide, however, in all climatic zones.

Dryland degradation (Desertification)

Desertification was defined by UNCED in *Agenda 21*, Chapter 12.2 as "Land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities". Land and degradation were defined as: "Land in this concept includes soil and local water resources, land surface and vegetation or crops" and "Degradation implies reduction of resource potential by one or a combination of processes acting on the land. These processes include water erosion, wind erosion and sedimentation by those agents, long-term reduction in the amount or

diversity of natural vegetation, where relevant, and salinization and sodication" (UNEP, 1992a:1).

Land degradation can be viewed from an ecological perspective, or from an economic one. From an ecological perspective the replacement of a forest by cropland or grassland is degradation, because biodiversity and biological productivity are greatly reduced, and soil erosion and nutrient depletion rates often increase. From an economic perspective, however, this land conversion does not have to represent degradation. If the land is managed well it will sustainably produce crops or livestock that over the long term could possibly have higher economic value than the forest, though in humid ecosystems some studies have shown that sustainable off-take and marketing of wild, non-wood forest products is economically more valuable than any other land use (de Beer and McDermott, 1989; Peters et al. 1989). Similar studies have not been performed on dryland forests, though there are a number of economic wild products that have current or potential commercial value (Stiles, 1988, 1994).

The most recent UNEP desertification assessment makes a clear distinction between *land degradation* and *soil degradation* (UNEP, 1992a:14). Land degradation, as the UNCED definition above states, includes soil, vegetation and water resources. Potential resiliency in any of these variables does not affect their assessed degradation status.

Hypotheses

The main interest of this article is in ascertaining whether and to what degree land degradation is linked to migration. There are two different schools of thought on the subject that can be termed Classic (or Malthusian) and Boserup forms, including neoclassical economics. Each can be presented as a sequence of propositions which include assumptions about population growth and density, land degradation, agricultural production and economic factors.[2] These models are relevant only to slow-onset, "voluntary" migration.

Classic

1. The growth of population pressure on land leads to one or more of the following: a shortening of fallow periods, the extension of cultivation into inappropriate marginal areas, cultivating on steep slopes, overstocking of livestock leading to overgrazing, over-exploitation of woody vegetation for fuel and construction, overexploitation of water resources, and intensification such as irrigation and the use of fertilizers and pesticides.
2. All of the above can lead to land degradation by one or more of the following: deforestation, deterioration of vegetation cover and species mix, water erosion, wind erosion, soil nutrient depletion, salinization, soil toxification by pesticides, and a lowering of the water table and the drying up of streams and lakes.
3. Soil and vegetation degradation and water scarcity lead to a lowering of agricultural production.
4. Increasing population and decreasing agricultural production result in a reduction of landholding size, increasing landlessness and increasing poverty.
5. Poverty decreases peoples' ability to cope with shocks, make investments, manage land well, and results in poor people 'mining' natural resources for subsistence. Investments are not made to replace resources that are used, leading to increased degradation of the resource base, increasing poverty even more. Shocks that particularly influence decisions to migrate are drought and biological disruptions, both resulting in famine.
6. Increasing population and land degradation lead therefore to migration, in the absence of non-farm employment, as people cannot support themselves due to insufficient food and cash crop production as well as water and biomass scarcity. Migration has been described as "escaping the Malthusian trap" (UNSO, 1994:5).
7. Land degradation, decreasing agricultural production and landholding size and increasing poverty can only be alleviated by implementing a number of interrelated actions: policies and laws ensuring land and resource security for rural communities; local participation in initiating, planning and implementing development interventions; basing new interventions on indigenous knowledge systems of management and technology; the introduction of appropriate new technologies developed with local participation; the availability of credits or subsidies to use for investments in the land; agricultural pricing that provides fair returns on labour and inputs; fair trade practices; relief from excessive debt burden and taxation, and economic incentives to make investments. A reduction of population growth would be a positive factor, but it is not the solution in and of itself.

Neoclassic (Based on Boserup, 1965, 1981; Simon, 1981)

1. Increasing population results initially in people extending into new lands. Labour productivity and technology remain the same.
2. As high potential new land runs out, fallow periods decrease and people move into more marginal lands.
3. Substitutes are introduced or innovated to make up for the lack of fallow and lower quality land, such as increased labour, ploughing, organic manuring or chemical fertilizers, irrigation, contour terracing and more efficient technologies. Agricultural productivity goes up to support the increased population. Population pressure acts as both a demand factor, pushing for increased production, and a supply factor, by providing the

labour necessary to introduce the needed changes.

4. A subsistence economy moves to a market economy as society becomes more complex with higher orders of socio-economic and political organization.
5. Continued population growth leads to continued technological innovation and market prices come to reflect degrees of resource or product scarcity in relation to demand.
6. Market and technological innovations correct for and control the depletion of natural resources. High prices for scarce resources lead to the "invention" of, or use of existing, substitutes, thus taking pressure off the threatened natural resource. Growth is unlimited because technology and market mechanisms will prevent scarcity of natural resources being a constraint.
7. Overexploitation and excessive depletion or degradation of a resource indicates that there has been a market failure. This occurs when institutions and people fail to organize and solve resource management problems, creating distortions and inefficiencies.
8. It is the role of government to introduce policies and programmes that will result in effective resource management. If this does not occur there is a "policy failure" analagous to the market failure, caused by an institutional failure. If, however, all policies and market forces operate properly there should be minimal environmental degradation, unemployment and, by inferrence, environmental migration of the slow-onset type. Most migration should result from economic pull factors attracting people to areas of industrial, agricultural and/or service sector growth. There would also be displaced persons, as defined above, caused by natural or physical disasters. Presumably there should be fewer repressees and refugees, as poverty and resource scarcities are reduced, but more oustees as economic development interventions displace more people.

It can be seen that the two models overlap in places and that they are not mutually exclusive. The major differences concern the respective views on population growth and economic forces. The Classic model sees population growth leading to an exceeding of the "carrying capacity" of the land, resulting in land degradation within certain boundary conditions. The conditions have been expressed as I = PAT (Erlich and Erlich, 1990), where I is environmental impact, P is population, A is affluence as defined by per capita consumption, and T is deleterious technology. It can be seen, therefore, that even small populations can have great impact if they have the affluence and technology to exploit resources and that large populations will not have a large scale impact if consumption and exploitative technologies are low. This does not explain degradation occurring with low population densities and low consumption and technology, however, a common enough phenomenon in the drylands.

What is missing from the equation is M, management, independent from technology (T). T is sometimes assumed to include management systems of technologies, but technologies can be managed in various ways with differing impacts on the environment. Technological packages designed in the North have been introduced to countries of the South, and often unintended results have occurred because local management practices of those technologies have been very different from those found in the North. Increasingly good management practices could be expressed conceptually as a rising quantity in a denominator to PAT. Thus, as M improves and the quantity grows larger, the impacts of PAT decrease.

Market forces and technological innovation are not seen as being so determinant with the Classic model, because some resources cannot be substituted for. These "meta-resources" (Erlich, 1989), such as the atmosphere, biodiversity, soil, forests and aquifers are the natural capital of the earth, necessary for survival. Their depletion or degradation cannot be substituted for through technology, nor does price elasticity conserve them.

Population growth

A further important consideration to introduce at this point is how we view future human population growth. Projections made by the United Nations Population Division and reported by others (UNFPA, 1993; WRI, 1994; UNEP 1993; UNDP, 1994) are based on the theory of "demographic transition" taking place in developing countries. This theory envisages a relationship between birth and death rates and stages in socio-economic development. The first stage is characterized by high fertility and high mortality rates, and population growth is low, as is socio-economic development. In the second stage, socio-economic development leads to a reduction in mortality, but fertility rates stay high leading to high population growth. Further socio-economic development leads to a slowing down of birth rates, and a slowing of population growth. The transition is complete in the fourth stage when birth rates stabilize and come more or less into balance with death rates.

Europe has already gone through the entire transition process and the annual population growth rate for 1990-1995 is only 0.3 per cent (UNFPA, 1993:49), most of this from immigration. Assuming this transition takes place in the rest of the world, the medium projection estimation for population growth by region up to 2025. If the transition is completed by all countries, global population should stabilize in about the year 2150 at 11.6 billion people (UNFPA, 1993:1). Since the transition is predicated on socio-economic development, what if this development does not occur? There are indications that the theory does not hold in some parts of the world even with socio-economic development (Abernethy, 1993). Although economic growth and lowering of fertility rates are positively correlated, there may be a third important variable that correlates with both, but less with economic growth and more with a lowering of fertility.

Studies have shown that female education levels correlate very highly with fertility rates (UNFPA, 1991:69-70; Sadik, 1989; World Bank, 1992:29; Ghimire, 1993). In a number of African countries the number of children desired by women drops with number of years in school (Ascadi and Johnson-Ascadi, 1983). It might be possible, therefore, to lower human fertility rates by raising the social status and educational level of women, even without economic development. Economic growth may not be the panacea for lowering population growth that many have thought, since there are cultural reasons promoting human fertility even within relatively rich societies.

Agricultural intensification

Agricultural intensification has been proposed by many as the only way that the earth can hope to cope with even minimal population growth (FAO, 1993; Bongaarts, 1994; Döös, 1994; van der Graaf and Breman, 1993; Falkenmark and Rockström, 1993). The World Bank (1992:135), using FAO data, found that 92 per cent of increases in cereal production between 1961 and 1990 came from intensification, while only eight per cent came from expansion onto new lands. Converting new land to agriculture also has the negative side effects of decreasing forest cover and biodiversity, and often of degrading marginal lands, thus intensification is seen as the preferred option. In addition, unused potential agricultural land is a finite quantity (0.5 to 1.7 billion ha, depending on whether marginal lands are included) that could easily be exhausted by uncontrolled human occupation (FAO, 1993; Bongaarts, 1994; Döös, 1994), depleting the world of biodiversity, timber and genetic resources, carbon sinks, and watershed protection.

Some 800 million people today go undernourished, though there is enough food globally to feed everyone well (UNDP, 1994:27). The main problem is food distribution and purchasing power of those in need. There are thus two related questions: (1) can enough food be produced in future to keep pace with growing population; and (2) even if there is enough food to feed everyone globally, can it get to food-deficit populations? Unequal geographical distribution of something as basic as food already is, and will in future, result in migration. Land degradation is relevant to this factor in that it exacerbates food distribution inequalities by lowering food production. Kendall and Pimental (1994) concluded that it was very unlikely that the earth could produce enough food and equitably distribute it to feed the world's population in the year 2050.

Trade and debt

Economic analyses are increasingly demonstrating the critical influence that trade, commodity prices and national foreign debt have on economic and agricultural policies, which in turn impact on the environment and social factors, including migration. Ghosh (1992), for example, argues that free trade, if accompanied by international investment and aid, will contribute substantially to reducing economic migration. He cites Singapore, South Korea and Malaysia as examples of countries that dramatically increased exports, which stimulated economic growth, which in turn resulted in these countries reducing or eliminating net emigration through the creation of employment opportunities. Other analyses, however, indicate that liberal or free trade has serious negative environmental consequences. The problem is much too complex to deal with in detail here, but some of the problems raised are:

1. Cash crops for export usually receive government and sometimes international incentives while food crops do not. Subsistence farmers have been displaced from good land and have had to move to urban centres, or marginal and forest lands. Income inequalities grow as state or private companies benefit from the cash crops, and marginal farmers are pauperized, contributing to further land degradation.
2. Trade liberalization stimulates production efficiencies and price reductions through competition. The commodity price reductions, however, are often achieved by the producer country internalizing environmental costs, i.e. the costs of natural resource depletion/degradation are not included in the price of the commodity. More has to be exported to maintain the same earnings as prices decline in response to freer trade and higher consumption. In the case of natural resource exports this increases depletion rates. Under the General Agreement on Tariffs and Trade (GATT), now administered by the World Trade Organization (WTO), countries cannot impose tariffs in an attempt to protect a threatened natural resource (Daly and Goodland, 1993).
3. Free trade will also cause social problems. Competition to reduce commodity prices is already resulting in lower wages for workers. Even in a developed country such as the United States, real wages have dropped for 50 per cent of the working population over the past 20 years, much of this due to international competition for export products. The trend for income disparities to increase between rich and poor countries and individuals will continue, resulting in social frictions and conflicts.
4. Trade, the production systems necessary to generate and sustain it, and commodity prices are also intertwined with concepts and methods of economic valuation and methods for determining national income accounts and macro-economic performance. Policies for encouraging cash crop or timber exports as opposed to food crops or forest conservation, for example, or for making investments such as soil and water conservation in drylands as opposed to producing something for export depend on the economic values given to alternative courses of action (Dixon et al., 1989; Pearce et al., 1993). If unused natural resources and the costs of depletion and degradation of

resources can be effectively valued and incorporated into national accounts, measures of macro-economic performance such as GDP and GNP will become obsolete.

One of the main factors stimulating unsustainable cash crop production in developing countries is foreign debt (Adams, 1991). Countries which borrow money from foreign private banks, governments and multilateral aid agencies or lending institutions for public investments and development projects need foreign exchange to service those debts. Foreign debt has been growing over the past two decades at a high rate, and today many countries are forced to seriously degrade their natural resources to service it (Harrison, 1987:24-25; Pearce and Warford, 1993; Pearce et al., 1993; Kahn and McDonald, 1990). The pressure to maximize exports has led some countries to adopt policies and practices that degrade natural resources (Pearce et al., 1993; McNeely, 1994). With income from exports tied up with servicing debt, domestic investment resources are not available for economic diversification.

Not all forms of trade are environmentally deleterious, however. Trade is necessary for economic growth and for providing employment opportunities for growing populations, therefore ways to encourage trade growth with minimal negative environmental consequences must be found. The WTO has a Committee on Trade and the Environment which is studying the problems involved in conflicts between the GATT accord and multilateral environmental agreements (MEAs) and the principles expressed in UNCED's *Agenda 21* (see issues of *Trade and the Environment*, available from the WTO office in Geneva). Governments which belong to WTO are sensitive to these issues and they are trying to find ways to continue support to the environmental provisions in existing MEAs while also adhering to the free trade (i.e. non-protective) regulations in the GATT.

Formulation of hypotheses

If the Classic model better fits reality, then the underlying cause of migration is poverty linked to environmental degradation, poor land management and population density. If the Neoclassic model is a better fit, then the underlying cause of migration is a market and policy failure, with poverty, land degradation, population and other factors being only proximate causes.

The interrelationship between poverty and land degradation is very complex, however, and simply stating that poverty leads to land degradation begs the question of why poverty exists. A vicious circle of poverty leading to degradation leading to worsening poverty and finally migration has been described by various authors (Bilsborrow, 1992; World Bank, 1992). Kates and Haarmann (1992) have documented several case studies from the drylands that link poverty, land degradation and migration. Ghimire (1993) concluded from three country case studies that increasing poverty and environmental degradation contribute to maintaining - if not actually increasing - human fertility rates. He found that economically vulnerable households see larger families as increasing their income options. Some view poverty as a mechanism through which other factors lead to degradation, such as government neglect and/or bad policies (Pearce and Warford, 1993), which offers a bridge of sorts between the Classic and Neoclassic models.

Based on the above propositions contained in the models, hypotheses can be formulated to test against available data:

Hypothesis 1 - Increasing population in association with decreasing agricultural production will result in high and increasing poverty rates.

Hypothesis 2 - High rates of poverty will be associated with high rates of land degradation.

Hypothesis 3 - High rates of land degradation will be associated with decreasing agricultural production.

Hypothesis 4 - Each of the following will be associated with high rates of migration:

- high population density
- decreasing land holding size
- increasing land degradation
- decreasing agricultural production
- increasing poverty

Hypothesis 5 - The more agricultural intensification the people of an area make, the higher will be per capita agricultural production and incomes.

Hypothesis 6 - The better the macro-economic performance of a country and the higher the agricultural intensification, the lower will be the rate of rural emigration.

One obvious problem with Hypothesis 6 is that it assumes equal economic growth between urban and rural and dry and non-dry areas. If most of the growth took place in urban and/or non-dry rural areas, this could act as a pull factor increasing dryland emigration. The hypothesis will be dealt with in this form first and any problems with it will be dealt with in the recycling fourth phase described in the methodology above.

The two models, series of propositions and hypotheses also demonstrate how closely linked are environmental and economic variables. If the hypotheses are correct, environmental migrants (as distinct from "displaced persons" as defined above) are also economic migrants. *The two categories are inseparable*. This would complicate calls made by some (El-Hinnawi, 1985; Jacobson, 1988; Schwartz, 1992; Myers, 1995) that persons who decide to migrate due to land degradation and related factors should be considered as "environmental refugees", eligible for international and/or national assistance under new agreements or arrangements.

Some might view this approach as simplistic and reductionist, as it focuses on selected variables and their interrelationships in a narrow, almost

mechanistic way. This approach has been chosen as an attempt to model a set of complex phenomena. That is what a model is, a simplification of a more complex reality. Models are necessary for first understanding and then influencing the outcome(s) of the interacting variables by acting in certain ways on critical variables.

Notes

1. The per cent of the world's land surface was based on the World Bank's (1992: Table A.6) global estimate of 13.01 billion ha of land of all categories.

2. Jolly (1994) has added two more models to these two, the "Dependency" and the "Proximate Determinant" models. I see both as variants of the Classic model and have included their main tenets here.

Bibliography

Abernethy, V. 1993. *Population Politics: The Choices that Shape Our Future*. New York: Plenum Press/Insight Books.

Adams, P. 1991. *Odious Debts*. London: Earthscan.

Appleyard, R. 1991. *International Migration: Challenge for the Nineties*. Geneva: International Organization for Migration.

Ascadi, J. and B. Johnson-Ascadi. 1983. *Demand for Children and Spacing in Sub-Saharan Africa*. Washington, D.C.: World Bank.

Beer, J. de and M. McDermott. 1989. *The Economic Value of Non-Timber Forest Products in Southeast Asia*. Amsterdam: The Netherlands Committee for IUCN.

Bilsborrow, R. 1992. *Rural Poverty, Migration and the Environment in Developing Countries*. World Bank Policy Research Working Paper 1017. Washington, D.C.: World Bank.

Bongaarts, J. 1994. Can the growing human population feed itself? *Scientific American* March, pp. 36-42.

Boserup, E. 1965. *The Conditions of Agricultural Growth*. London: George Allen and Unwin.

_____. 1981. *Population and Technological Change: A Study of Long-Term Trends*. Chicago: University of Chicago Press.

Daly, H. and R. Goodland. 1993. An ecological-economic assessment of deregulation of international commerce under GATT. Draft *Environment Working Paper*, Washington, D.C.:World Bank.

Dixon, J., D. James and P. Sherman (Eds.). 1989. *The Economics of Dryland Management*. London: Earthscan.

Döös, B. 1994. Environmental degradation, global food production, and risk for large-scale migrations. *Ambio* 23(2):124-130.

El-Hinnawi, E. 1985. *Environmental Refugees*. Nairobi: UNEP.

Erlich, P. 1989. The limits to substitution: Meta-resource depletion and a new economic-ecological paradigm. *Ecologica Economics* 1.

Erlich, P. and A. Erlich. 1990. *The Population Explosion*. London: Hutchinson.

Falkenmark, M. and J. Rockström. 1993. Curbing rural exodus from tropical drylands. *Ambio* 22(7):427-437.

FAO. 1993. *Agriculture: Towards 2010*. Rome: FAO.

Ghimire, K. 1993. *Linkages between Population, Environment and Development*. Geneva: UNRISD.

Ghosh, B. 1992. Migration, trade and international economic cooperation: Do the interlinkages work? *International Migration* 30(3/4):378-385.

Graaf, S. van der and H. Bremen. 1993. *Agricultural Production: Ecological Limits and Possibilities*. Rapport Production Soudano-Sahélienne No. 3. Wageningen:CABO-DLO.

Harrison, P. 1987. *The Greening of Africa*. London: Paladin Grafton Books.

Homer-Dixon, T. 1993. *Across the Threshold: Empirical Evidence on Environmental Scarcities as Causes of Violent Conflict*. Toronto: Peace and Conflict Studies Program, University of Toronto.

IOM/RPG (International Organization for Migration/Refugee Policy Group). 1992. *Migration and the Environment*. Geneva: IOM.

Jacobson, J. 1988. *Environmental Refugees: A Yardstick of Habitability*. Paper No. 86, Worldwatch Institute, Washington, D.C.

_____. 1989. Environmental refugees: Nature's warning system. *Populi* 16:30-41.

Jolly, C. 1994. Four theories of population change and the environment. *Population and Environment* 16(1):61-90.

Kahn, J. and J. McDonald. 1990. *Third World Debt and Tropical Deforestation*. Binghamton:Department of Economics, SUNY.

Kane, H. 1995. Leaving home. In: (Ed.) L. Brown. *State of the World*. New York: W.W. Norton, pp. 132-149.

Kates, R. and V. Haarmann. 1992. Where the poor live. Are the assumptions correct? *Environment* 34(4):5-11,25-28.

Kendall, H. and D. Pimental. 1994. Constraints on the expansion of the global food supply. *Ambio* 23(4):198-205.

Loescher, G. 1992. *Refugee Movements and International Security*. London: International Institute for Strategic Studies, Adelphi Paper No. 268.

McNeely, J. 1994. Trade and biological diversity: The internalization of environmental costs. *Trade and the Environment* (GATT) TE 009:49-54.

Myers, N. 1995. *Environmental Refugees*. Draft report for the Climate Institute, Washington, D.C.

Nordhaus, D. 1992. Lethal Model 2: The limits to Growth revisited. *Brookings Papers on Economic Activity* No. 2.

Pearce, D. and J. Warford. 1993. *World Without End. Economics, Environment and Sustainable Development*. Oxford: Oxford University Press.

Pearce, D., D. Whittington and S. Georgiou. 1993. *Economic Values and the Environment in the Developing World*. Report to UNEP

by the Centre for Social and Economic Research on the Global Environment, University College London.

Peters, C., A. Gentry and R. Mendelsohn. 1989. Valuation of an Amazonian rainforest. *Nature* 339:655-656.

Sadik, N. 1989. *Investing in Women: The Focus of the 1990s*. New York: UNFPA.

Schwartz, M. 1992. *1992 Report on the Relationship Between Human Rights and the Environment*. San Francisco: Natural Heritage Institute.

Simon, J. 1981. *The Ultimate Resource*. Princeton: Princeton University Press.

Stiles, D. 1988. Arid land plants for economic development and desertification control. *Desertification Control Bulletin* 17:18-21.

_____. 1994. Tribals and trade: a strategy for cultural and ecological survival. *Ambio* 23(2):106-111.

Suliman, M. 1992. *Civil War in Sudan: The Impact of Ecological Degradation*. Zürich: Swiss Federal Institute of Technology, Centre for Security Studies and Conflict and Swiss Peace Foundation, Environment and Conflicts Project Occasional Paper No. 4.

Trolldalen, J. 1993. Environmental Refugees in Drylands. Paper presented at the UNEP International Workshop "Listening to the People: Social Aspects of Dryland Management", December, Nairobi, Kenya.

Trolldalen, J., N. Birkeland, J. Borgen and P. Scott. 1992. *Environmental Refugees*. Oslo: World Foundation for Environment and Development and the Norwegian Refugee Council.

United Nations. 1991. *Report of the Working Group on Solutions and Protection to the Forty-Second Session of the Executive Committee of the High Commissioner's Programme*. EC/SCP/64, New York: United Nations.

_____. 1993. Special Issue on the Expert Group Meetings convened as part of the substantive preparations for the International Conference on Population and Development. *Population Bulletin of the United Nations* 34/35:1-153.

_____. 1994. *Annual State of World Population Report*. New York: United Nations Population Division.

UNDP. (United Nations Development Programme). 1994. *Human Development Report*. New York: Oxford University Press.

UNEP. 1992a. *Status of Desertification and Implementation of the United Nations Plan of Action to Combat Desertification*. UNEP/GCSS.III/3, Nairobi.

_____. 1992b. *World Atlas of Desertification*. London and Nairobi: Edward Arnold and UNEP.

_____. 1993. *Environmental Data Report 1993-1994*. Oxford: Blackwell Publishers.

UNFPA (United Nations Population Fund). 1991. *Population, Resources and the Environment*. New York: UNFPA.

_____ 1993. *The State of World Population*. New York: UNFPA.

UNHCR (United Nations High Commissioner for Refugees). 1991. "Environmental refugees" - protection aspects. *Rapport. Special Edition on the Environment* No. 10.

UNSO. 1994. *Poverty Alleviation and Land Degradation in the Drylands*. New York: UNSO.

Westing, A. 1994. Socio-political dimensions of desertification-induced population movements. Paper presented at the International Symposium on Desertification and Migration, Almeira, Spain, February.

Widgren, J. 1990. International migration and regional stability. *International Affairs* 66:749-766.

World Bank. 1992. *World Development Report 1992. Development and the Environment*. Oxford: Oxford University Press.

_____. 1994. *World Development Report 1994. Infrastructure for Development*. Washington, D.C.: World Bank.

WRI (World Resources Institute). 1994. *World Resources 1994- 95*. Oxford: Oxford University Press.

National Strategy to Combat Desertification in the Republic of Kazakstan

Task force under the leadership of

Prof. I. Baitullin and Dr. G. Bekturova

of the Ministry of Ecology & Bioresources of the Republic of Kazakstan

Introduction

In accordance with the United Nations Convention to Combat Desertification, the National Action Programme to Combat Desertification in the Republic of Kazakstan (NAP) has been developed by the Ministry of Ecology and Bioresources of the Republic of Kazakstan with support from the United Nations Environment Programme (UNEP).

Desertification takes place in a significant part of the Republic's territory, which has already resulted in negative social and economic consequences. At present, 179.9 million hectares or 60 per cent of the country's territory suffers from desertification to a greater or lesser extent. Further degradation of the natural environment against a background of global climate aridization will inevitably lead to irreversible loss of biodiversity, a reduction of land fertility, and a corresponding deterioration in living standards.

The NAPCD was developed with the participation of leading scientists, prominent specialists from different ministries, agencies and scientific organizations of Kazakstan who joined the Task Force under the Ministry of Ecology and Bioresources of the Republic of Kazakstan. Scientific coordination of the programme preparation was undertaken by I. Baytullin, and Dr. G. Bekturova.

The Programme includes the deep analysis of the causes of desertification and an action strategy: desertification monitoring; environmental zoning of the republic; improvement of the management system; scientifically justified measures on prevention of further land degradation; improvement of pastures and hay lands; reduction of social and economic consequences of desertification and other issues related to the resolution of the desertification problem.

Natural environmental conditions in Kazakstan

The enormous territory of Kazakstan is characterized by severe continental arid climate. There is a range of nature zones in the territory: forest-steppes, steppes, semi-deserts and deserts. Different landscapes form within these zones. In the mountain areas, mountain steppes, forest-meadows, sub-alpine, alpine and snow-glacier zones follow each other. The average annual temperature in Kazakstan changes from 0.8-C (Petropavlovsk) to 12.1-C (Shimkent) and annual precipitation - between 129 mm (Kzylorda) and 616 mm (Almaty). In the mountain areas the amount of precipitation increases with altitude from 700 mm to 1,500 mm.

Eighty-five thousand rivers with a total length of 223 thousand kilometres flow through the territory of Kazakstan. There are more than 50,000 lakes and 4,000 artificial water bodies with a total water surface area of 45,000 sq. km. At present, the natural regime of rivers and water bodies has been significantly changed by economic activities.

On the plains of Kazakstan three main soil zones can be identified: black earth, chestnut, brown and brown-gray soils. In the mountains and foothills the following zones exist: foothills desert-steppe, lower mountain steppes and forest-steppes, medium mountain meadow-forest and high mountain meadow. Different types of saline land can also be found on the plains.

The vegetation of Kazakstan is characterized by rich floristic (more than 6,000 genera) and cenotic (more than 2,000 communities) diversity. The steppe vegetation on black and chestnut soils consists of a rich diversity of grasses: red feather grass and tipchak - feather grass, in chestnut soils - xerophites-diverse

grass-feather grass, in light chestnut soils -wormwood-feather grass-tipchak communities.

The desert vegetation consists of xerophite semi-bush and semi-shrub communities. Brown and brown-gray soils form salt bush deserts. The desert zone is divided into three types: northern (32 per cent), middle (50 per cent) and southern (18 per cent).

The vegetation on sandy soils supports 52 formations, 13 of them common to Central Asian desert zones.

The desert saline soil vegetation is presented by galophite and xerophite formations. Meadow and meadow-tugay vegetation grows along the banks of rivers, lakes, and pools, such vegetation is associated with hydromorphic soils.

Mountain vegetation depends on differing environmental conditions, altitude, hill side position and stoniness of the soils. Kazakstani fauna includes up to 835 species of vertebrates and close to 8,000 species of invertebrates. The vertebrates fall into the following classes: mammals, birds, reptiles, amphibians, fish and round-mouths. Rodents make up almost half the mammal numbers.

There are 489 species of birds, of which 388 build their nests in Kazakstan.

More then 30 fish species out of the 104 living in Kazakstan are valuable marketable fish and 16 species are rare. There are about 300 species of shell-fish, about 70,000 species of arthropods and 60,000 species of insect.

Spreading of the main animal species in Kazakstan at present complies with the regularities of the horizontal and vertical landscape zones. Human activity has the greatest influence on the geographical and species spread of animals. Several animal species that previously inhabited Kazakstani territory have disappeared completely while others occupy increasingly reduced areas.

Social and economic conditions and resources of Kazakstan

Population and living standards: There are 16.68 million people in Kazakstan, 9.33 million (56 per cent) reside in towns, 7.35 million (44 per cent) reside in villages, including 7.41 million (44 per cent) residing in desert zones.

Ethnicity: Kazaks - 46 per cent, Russians - 34.8 per cent, Ukrainians 4.9 per cent, Germans - 3.1 per cent, Uzbeks - 2.3 per cent, Tartars - 1.9 per cent and so on. The average population density is 6.1 persons per sq. km. and 2.21 persons per sq. km in the desert zones.

In 1991, when the republic became independent, more than 1.2 million people, including 472,000 of Russians and 410,000 Germans left Kazakstan. Possible workforce 9.1 million, retired and disabled - 2.8 million. The total number of employed is 5.85 million which includes 5.63 million workers and specialists, and 0.32 million farmers. In 1995 there were 139.000 of unemployed in Kazakstan. The average salary in the Republic was 1742 tenge (US$48) in 1994, and 5117 tenge (US$89) in 1995. The per capita income was 2173 tenge (US$33) but the consumer subsistence need was 3170 tenge. There were 10.06 deaths and 16.6 births per 1,000 in 1995. Life expectancy was 60.3 years for men and 70.3 years for women, the male to female ratio is 45:51.

Kazakstan has 19 oblasts (regions), 220 rainiest (districts), 2,496 aul districts, 83 towns, 200 villages, and 8,188 settlements.

Land resources: The whole territory of Kazakstan is 272.5 million hectares large including 182.3 million hectare of pastures, 31.9 million hectares of ploughed fields, which includes 1.8 million hectares of irrigated ploughed fields, 5.1 million hectares of hayfields, 2.8 million hectares of fallow land, and 10.4 million hectares of forest.

The agricultural soils without any preliminary irrigation occupy 21.8 million hectares. Saline soils - 93.5 million hectares, 26.7 million hectares of soils that are under erosion and deflation.

During the cultivation of virgin and fallow lands, some saline soils, eroded soils, rocky soils and sandy soils were unjustifiably ploughed. In recent years, 3.6 million hectares of grazing land were left unploughed. 182.1 millions hectares of land need recultivation. Thus, 82 per cent of agricultural land is pastureand 75 per cent of which is located in desert and semi-desert zones. 68 per cent of all ploughed fields are irrigated.

Water resources: Most of Kazakstan occupies an arid zone with limited water resources. Total water resources (rivers, lakes, reservoirs, glaciers, underground waters and others) are estimated at 450 cubic kilometres of which 101 cubic kilometres are commercially used. The water supply is 36.4 thousand cubic metres per square kilometre and six thousand cubic metres per person per year.

Eastern Kazakstan has the best water supplies, it has 200-290 thousand cubic metres per square kilometre, the least supplied territory is West Kazakstan which has 0.36 thousand cubic metres per square kilometre.

The underground water resources in the republic are estimated at 61 cubic kilometres, which include 40 cubic kilometres of freshwater, 2.6 cubic kilometres of underground water is used.

Biological resources: The species composition of wild flora accounts more than 6,000 species of higher plants. More than 400 plants are grown on plantations, there are 100 medicinal plants and a huge group of oil plants. There are 68 types of trees and 700 types of bushes. Forests occupy 21.6 million hectares which include 10.4 million hectares of dense forest plantations.

Five hundred and forty bird species live in Kazakstan, including 43 types of waterfowl. More than a half the 104 fish species are marketable.

Cereals grow on almost 20 million hectares. Cotton, rice, potatoes, vegetables and fruits are cultivated on irrigated land.

Desertification

The desertified area of Kazakstan covers 179.9 million hectares. A steady expansion of this process has been observed. The reason for this is economic and social instability during the transition period (see fig. 1).

Natural reasons of desertification are connected with climate aridization and an increase in average annual temperatures (by 0.2°C every 10 years over the last hundred years); local aridization in the Aral Sea area; climate warming, doubling CO_2 concentration by 2050 and a decrease

of atmospheric precipitation by 20 per cent are forecast. The repetition of droughts, and dust storms (90 days per year), weather extremes, lithoedaphic plains conditions (large sand areas - 30 million hectares, saline soils - 12.7 million hectares) and natural disasters (mountain torrents, floods, etc.) make for a high natural internal danger of desertification under excessive man-made impacts. The man-made factors of land degradation in Kazakstan are the same as in the majority of arid countries, they are: excessive pasturing that caused the degradation of 49 million hectares of pasture; a poor agriculture system, that desertified one third of the ploughed land - 10.4 million hectares; mining, that destroyed about 10 million hectares of productive agriculture land; regulation of river outlets and the construction of reservoirs, that resulted in the Aral Sea crisis, the drying of the Balhash lake, and desertification of river flood-lands.

Unplanned forest cuttings, hay cuttings, fuel and forage supplying and industrial pollution of soils and underground water, as well as urbanization all add to degradation of the land.

There are nine major types of desertification: Plantation degradation, where forest density decreased by 10 per cent, the area and productivity of apple plantations decreased by 24 per cent,

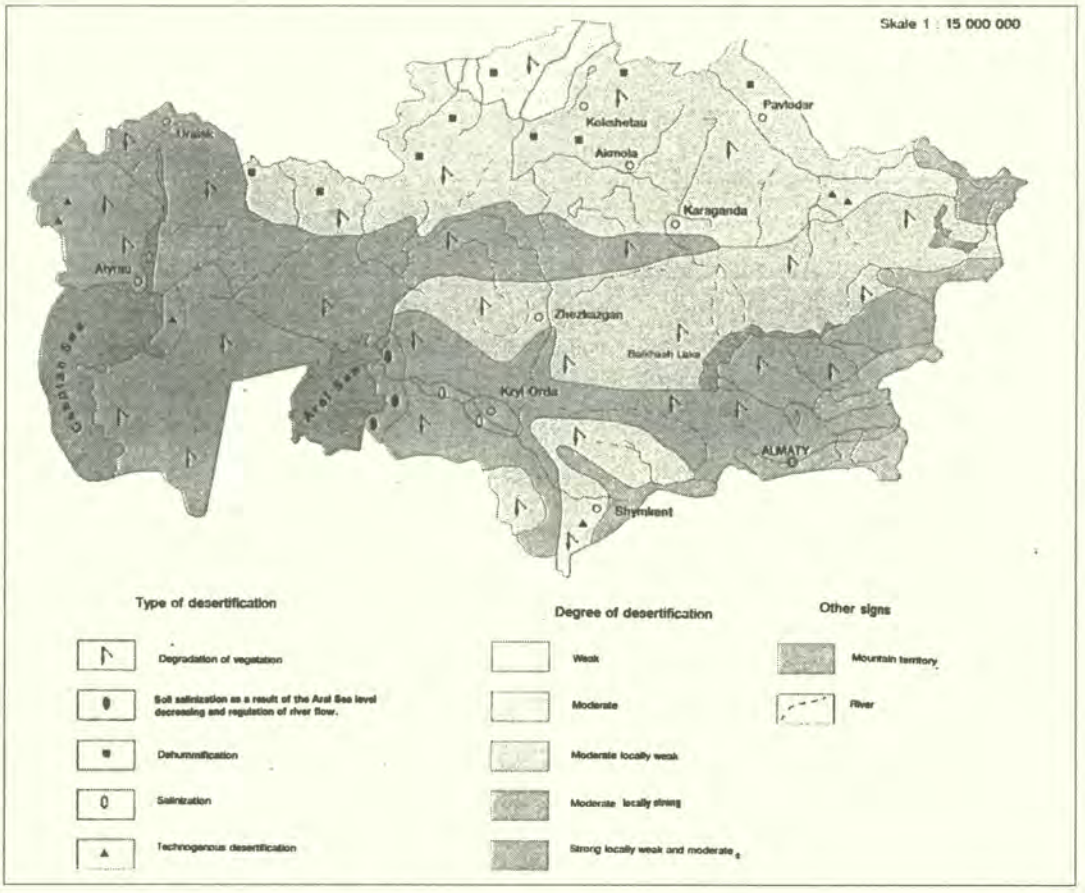
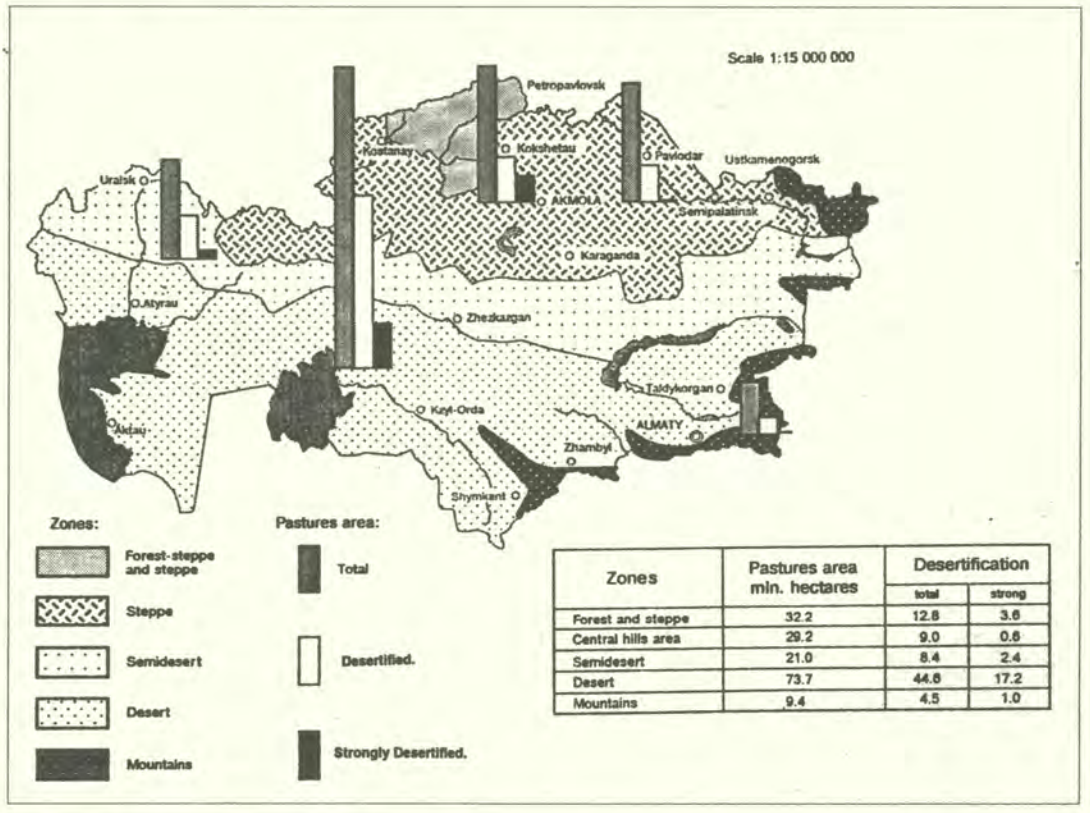


Fig. 1: Map of Anthropogenous Desertification of Kazakstan



Zones	Pastures area mln. hectares	Desertification	
		total	strong
Forest and steppe	32.2	12.8	3.6
Central hills area	29.2	9.0	0.6
Semidesert	21.0	8.4	2.4
Desert	73.7	44.6	17.2
Mountains	9.4	4.5	1.0

Fig. 2: Degradation of pastures

the fir and spruce - by 16 per cent, saksaul - 40-50 per cent, the tugay forests are also diminishing. 13.6 million hectares of desert and semi-desert, 4.3 million hectares of pastures in the mountains and 3.6 million hectares of steppe, suffer from the most severe desertification. Pastureland decreased by 3.3 million hectares and its productivity has diminished 2 times since 1990;

Wind soil erosion (deflation) affects all plain landscapes, 20.5 million hectares of ploughed fields, and 25 million hectares of pasture. Less deflation of ploughed fields is predicted where advanced technology is used. It is expected that local desertification of sandy areas will increase and that it is connected with excessive grazing around water wells (Fig. 2).

Water erosion covers an area of 19.2 million hectares of vulnerable land. Every year snow-melting and rain water (more than 5 billion cubic metres) moves up to 60 million tons of soil from ploughed fields. Surface flow that includes up to 20-40 per cent of the annual precipitation results in water erosion and reduces productive soil moisture. Almost 12 million hectares of black and brown steppe earth suffer from water erosion and 5.2 million hectares are severely desertified, 6.7 million hectares - desertified to a lesser extent. 3.5 million hectares of desert and 3.5 million hectares of foothills are degraded, including 0.5 million hectares that are affected by irrigation erosion. The erosion in the irrigated fields (1.8 million hectares) is noted everywhere;

Soil dehumification is noted on 11.2 million hectares of virgin lands in the steppe zone. In deserts, it is connected with irrigation erosion (1.8 million hectares) and excessive grazing which result in deflation processes.

Salinization of irrigated soils is common for hydromorphological soils, and saline soils in irrigated ploughed areas which include 376.7 thousand hectares (20 per cent of all irrigated lands). There are 2.4 million hectares of land that could be used for irrigation while about 0.5 million hectares are not used because of secondary salinization and problems with the irrigation system. The area of land that is not used increased five times after 1990;

Soil salinization related to lake drying (photo 1). Desertification of this type is registered in the black lands up to 30-37 per cent, at the brown lands to a maximum of 50 per cent and at the brown desert lands up to 55 per cent of zone areas. As swamp soils dry salinization takes place, which causes the aggravation of the water-physical soil conditions and solonchak formation.

Soil and ground water pollution results from the release of atmospheric effluents in towns and industrial centres (more than 4 million tons per year); the storage of billion tons of the industrial wastes, which discharge more than 6.0 cubic kilometres of waste water; pesticide usage (up to 42 tons of active component, per 26 million hectares); pollution by mineral fertilizers. Radio-nuclides, organic materials (oil products included), chemicals, nitrates and nitrites, atmospheric soil oxidants, cattle-breeding waste water, etc. are also pollutants. Exceeding emission limits for lead, cadmium, copper, chrome, and nickel, many tumes over has been registered in Ust-Kamenogorsk, Zyrianovsk, Leninogorsk, Aktubinsk, Shimkent etc.. The quantity of chemical pollution in soils around industrial enterprises doubles every ten years (Shymkent). Underground water including drinking water is polluted by flooding and filtering from industrial areas, agricultural fields, cattle-breeding farms, urban agglomerations etc.

Technogenic desertification occurs largely in the industrially developed areas and in the transport and engineering infrastructures. It has been identified over an area of 181.3 thousand hectares including 87.6 thousand hectares devoted to mining. The volume of industrial pollution in Kazakstan was about nine thousand tons (3.4 tons per cubic metre) in 1990. Oil and gas pipelines form degraded strips of land and create the risk of pollution to soils, vegetation and air because of many accidents. Space launching and military testing sites (6 per cent of the Republic territory) also affect the ecosystems and population and create specific forms of technogenic desertification: The violation of the hydrological regime is related to the reallocation and share of fluvial discharge and desertification of river meadows, lakes drying, sealing or swamping of lands, and salinization of irrigated lands.

Photo: L. Kurochkina

Photo 1: Soil salinization in the Caspian Sea Basin.

Social and economic consequences of desertification

The Aral and Ili-Balkhash regions with a population of 5.4 million are most affected by desertification. Excessive use of pastures results in pasture exhaustion and degradation. From 1990 to 1995 the area of degraded pastures increased by 10.7 millions square kilometres. The over-regulation of fluvial discharge stopped flooding, reduced ground water, increased land salinization and decreased the cattle population. The water deficit had a negative impact on the economic development of the region and living conditions of the population. The living conditions of fish and wild animals worsened, 5.6 million hectares of ploughed fields in Central and North Kazakstan were damaged by water erosion; crop production fell by 20 to 30 per cent. The Caspian Sea flooded 357 thousand hectares of fertile land, pasture and hayfields in the Caspian region. Industrial enterprises polluted lands around them with their emissions. The defence industry took over more than 10 million hectares of ploughed fields and pastures for their own use.

Damages from desertification in Kazakstan is estimated in tens of millions of US dollars.

The exhaustion of water resources has resulted in industrial decline, has diminished the number of jobs, decreased living standards, and raised the possibility serious food shortages. Almost 300,000 people, including 20,000 from the Aral Sea region, left their territories in 1995 as a result of desertification. A new category of migrant - the environmental refugee - has emerged. In the desert zones morbidity rates are higher than in other regions because of poor quality drinking water, a decrease in meat, milk and fish consumption, an absence of drugs and a low level of healthcare. Digestive systems diseases, stomach ulcers, skin diseases, anaemia among children and many other diseases increased significantly. Higher levels of mortality, especially infant mortality was registered in the regions of desertification. In 1995 there were 29 - 36 deaths per 1,000 births. Desertification forecasts predict a continuing process of land degradation and migration from the Balkhash and Aral regions. The transformation of coastal pastures into deserts, and flooding of the oil and gas mining wells as well as a worsening of living standards will continue.

Action strategy to combat desertification

Developing the main principles of environmental zoning in Kazakstan

The strategy of Environmental Safety of the Republic of Kazakstan (President's Decree of March 1996) defined the strategic aims of the Republic in the area of the rational use and protection of natural resources, which is directed towards the protection of biodiversity and the maintenance of a favourable environment for human beings. The main pre-requisite of such policy implementation is the creation of an effective management of nature which includes: development of environmental limits and environmental zoning of the Republic's territory. Such management will be the basis for the resolution of desertification problems at the national and local levels.

Environmental zoning includes:

(a) Defining natural and socio-economic systems and their regional allocation, setting borders for environmental geographical regions (EGR);

(b) Defining the environmental limits for nature use for each EGR;

(c) Developing environmental territorial passports for every EGR which would include characteristics of actual use of natural resources;

(d) Assessment of the status of EGR and the degree of desertification; (EGRs) are located within the borders of administrative oblasts. Districts and EGRs are decided upon according to the natural landscape taking into account natural climatic and socio-economic systems. The potential capacity of the EGR system to sustain human impacts shall be set for every EGR. The normative (environmental limits) of nature use, taking into account the present environmental conditions of the EGR (desertification for example), shall be developed.

Four main groups of restrictions were identified.

The first group. Limits on emissions, discharges and waste disposal. The level of limitation characterizes the capability of ecosystems to sustain certain levels of pollution and maintain stability.

The second group. Environmentally permissible limits of utilization of natural resources from the regions i.e. permissible areas of ploughed fields, maintaining necessary water and forest safety zones, optimal water regime of lakes and rivers, acceptable limits of pasture use. Fauna and land resource use, (forest raw materials) fall under this category providing for the conservation of their biodiversity and reproduction.

Limits on irrigation and water supplies are set taking into account the present surface and underground water sources, and the need to protect environmental conditions of rivers and lakes and other water reservoirs.

The third group. Environmental limitations on certain economic activities. The environmentally permissible structure of industry and agriculture which is ecologically acceptable for the current territory is identified. The limits are implemented to protect the territories from industries that are not permissible in certain environmental and natural climatic conditions. The basis for this assessment is the "passport" of the EGR and gives an account of the limitations identified.

The fourth group. Limitations on industrial activity in EGR territories: defining territories according to use, i.e. full-scale industrial activities, protected territories (wild life reserves, water and forest protected zones etc.), territories with partial limitations (rest zones, zones of soft pasturing, reserves, national parks, recreational areas etc.). Such limitations and a wide network of protected territories will assist regions to solve problems of biodiversity, desertification and could help restore damaged biological systems.

Information about the actual condition of the EGR is provided by the "passport" where problems such as pollution, the list of permitted industries, permitted resource utilization (lands, pastures, water etc.), industrial activities and the degree of desertification and its type would be recorded.

Environment assessments identified the following region groups:

- Environmentally and economically optimal regions with preserved environmental potential which allows for economic development through the use of rational technologies (desertification is absent);
- Regions with balanced nature use potential are regions where all environmental potential is in use. Economic development is possible with the use of environmentally clear and resource-saving technologies, the reallocation of quotas and limits between existing and new (reconstructed) industries thereby keeping a balance between nature resources and resource utilization. Desertification occurs but it is reversible;
- Regions where environmental potential is overused but it is possible to reduce the degradation and pollution of the environment and achieve the permissible level of nature resource utilization through active environmental protection. Economic development in these regions should be stopped without hesitation. Economic development in this situation should concentrate on the development and introduction of environmentally clear and resource-saving technologies, pollution clean-up and the reversal of the previous activities' impacts;
- Regions where environmental potential is overused at the current rate of economic, social and technological development. Desertification is widespread and it is impossible to recover these territories. Environmental problems in such regions would be resolved if financial and technological possibilities were developed.

Territorial Integrated Schemes of Nature Protection are being developed in oblasts on the basis of environment assessment and zoning. The Schemes provide for ways of economic development and environmental stabilization (or improvement) including for desertification and taking into account EGR at the national and regional levels.

Environmental zoning is the basis for the creation and functioning of the nature use management system. The Ministry of Ecology and Bioresources (MEBR) started this work in 1995. Detailed environmental zoning is planned for 1997-1998 at the oblast administrative level using uniform methodology and regulations on environmental pollution; water resource protection, soil, vegetation, wild animals, and nature protection as well as the creation of environmental territorial passports and environmental assessment.

Organizing monitoring of desertification

Data on desertification in Kazakstan has not been included in the Global Environment Monitoring System (GEMS), the Monitoring Assessment Research Centre (MARC), or Geographic Information Systems (GIS). There in no uniform data bank about the desertification process in the Republic, nor a uniform system or integrated organizational structure to monitor desertification.

Development of a monitoring system and informational support of desertification, land degradation and biodiversity was started by MEBR in 1994 within the framework of implementation of the International Convention to Combat Desertification.

The conceptual basis of the desertification monitoring is following:

(a) The system of monitoring to assess land degradation and pollution; types, degrees, factors, reasons and effects of desertification is implemented at the ecosystem level according to the "Environment Protection Law";

(b) The objects of monitoring are natural and natural-and-human ecosystems, their complexes (landscapes) for the regions affected by desertification marked on the maps of environmental zoning;

(c) The areas are chosen using the system: control (background conditions not changed) -moderate desertification - strong desertification ecosystems under similar natural conditions;

(d) When the impact factors and types of desertification are identified, their total effect is taken into account and integrated to assess the degree of desertification;

(e) Economic conditions are a factor which influence the dynamics and environmental status of ecosystems and their sustainable development;

(f) Tasks to solve desertification problems are defined by their necessity at the local level; this is the system-forming element of the monitoring;

(g) The main aim of such monitoring is the assessment of environmental and economic damages brought about by degradation of natural ecosystems;

(h) The monitoring system assumes the following attributes: openness - the possibility to access all chains, add new tasks, connect to other environmental monitoring systems at any level; adaptability - the possibility to change priorities and correct tasks; discreetness - regular information collection and analysis, and assessment of the system's effectiveness;

(i) The system is designed in the form of a multi-sector, multi-user complex with the possibility of increasing the amount of tasks and objects. Its basic element is GIS which contains an electronic maps base, standard software and models of map processing.

The basis of desertification monitoring.

Weather monitoring (drought, frosts, extreme hydrological and thermal conditions, severe winters) is implemented by the hydrological and meteorological service. Monitoring is performed by 219 meteorological stations and 307 posts.

Land and biological resource monitoring includes monitoring of soil, vegetation, wild life, agricultural areas (pastures, ploughed fields, hayfields), forests, industries, protected territories (wild life reserves, national parks, natural recreational areas). Parts of this monitoring are provided by the State Committee of Land Use, the Committee for Forest Industry, and the Ministry of Agriculture but they do not include desertification analysis and environmental assessment of ecosystems.

Ground and underground water control includes quantity and quality assessment, impacts on the conditions of natural and biological objects, trends of mode change and pollution.

Environmental zoning and standardization of nature use by environmental regions is made on the basis of mapping.

Recommended organizational arrangements

There is an obvious need for a uniform desertification monitoring service. The MEBR will coordinate, process the work, support data bases and implement the expert work assessment. This unit will be part of the unified state environmental monitoring system of the Republic of Kazakstan and will provide analysis, assessment and prognoses of environmental conditions on the basis of desertification criteria.

The main tasks of this unit are the following: to choose sites (for stations); define criteria and standards of land use (soils, vegetation and other resources, including water resources) in ecosystems as well as decide the necessary elements for recording.

The structure of monitoring

The most important chains of monitoring are the following:

(a) Timely collection of data at field sites;
(b) Transfer of information to the next structural level (republican and oblast centres);
(c) Analysis, interpretation, presentation of results to coordinating organizations;
(d) Archiving of data and results of the analysis;
(e) Data input to the GIS. The monitoring structure assumes automatic data receiving and computer processing which includes electronic map models displaying changes. The Committees for Land and Meteorology have some experience of assessment and the archiving of agricultural and meteorological information. It is recommended that a review of the objects (points) of monitoring be undertaken, to detail standards and criteria, to add the desertification assessment tasks, and to put all monitoring in a uniform system.

Land monitoring which is provided by the Land Committee should include desertification monitoring and assessment. It is recommended that monitoring of environmental degradation be increased and that standardized assessments and detection of desertification sites be made. The control and enforcement of environmental standards of nature use should be made on the basis of environmental zoning and map analysis.

Land monitoring should be supported by regular implementation of air and space photography, geodesic, geographic, soil, geographical, botanical and other research methods of EGR. For ploughed fields, their agricultural productivity and environmental safety be defined, and human and natural factors of desertification which lead to land degradation assessed.

On the basis of geological and botanical research control of pastures and hayfield condition can be made by comparing previous research results and standard indicators (standard vegetation maps).

A territorial zone station network to monitor desertification in the environmentally unstable regions needs to be established in the first place in areas such as the Aral and Caspian Seas, Balkhash Lake, Semipalatinsk testing site, East-Kazakstan Oblast and also in intensively farmed agricultural lands such as on ploughed land, rice plantations, cotton fields, gardens, and berry fields (Figure 3). Information collection is accompanied by a determination of the sustainability of the lands against human impact, and by the setting of environmental standards. It is suggested that environmental monitoring maps of desertification and assessment be developed and prognosis of its dynamics made.

Observations concerning changes in the wildlife population in areas of desertification are very limited. Data collection in the wild reserves does not fulfill the task of environmental monitoring. It is therefore recommended that a set of tasks concerning wildlife dimunation in desertified regions be developed and provision made for registration of biodiversity changes.

Space research methods

Application of space observation of desertification has been carried out by the Space Research Institute of the Republic. Satellite information is being received for several points which could help in the integrated analysis of desert conditions including the detection of deflation sites, decreasing biological productivity, water erosion, natural catastrophes and land pollution around cities and villages. The high speed of information input, wide field of view and precise cartography increases data reliability, including data on areas damaged by desertification. The general task of land degradation monitoring by space methods should be set.

There is a need for surface decoding in monitoring stations where model areas will be chosen to get model space images,

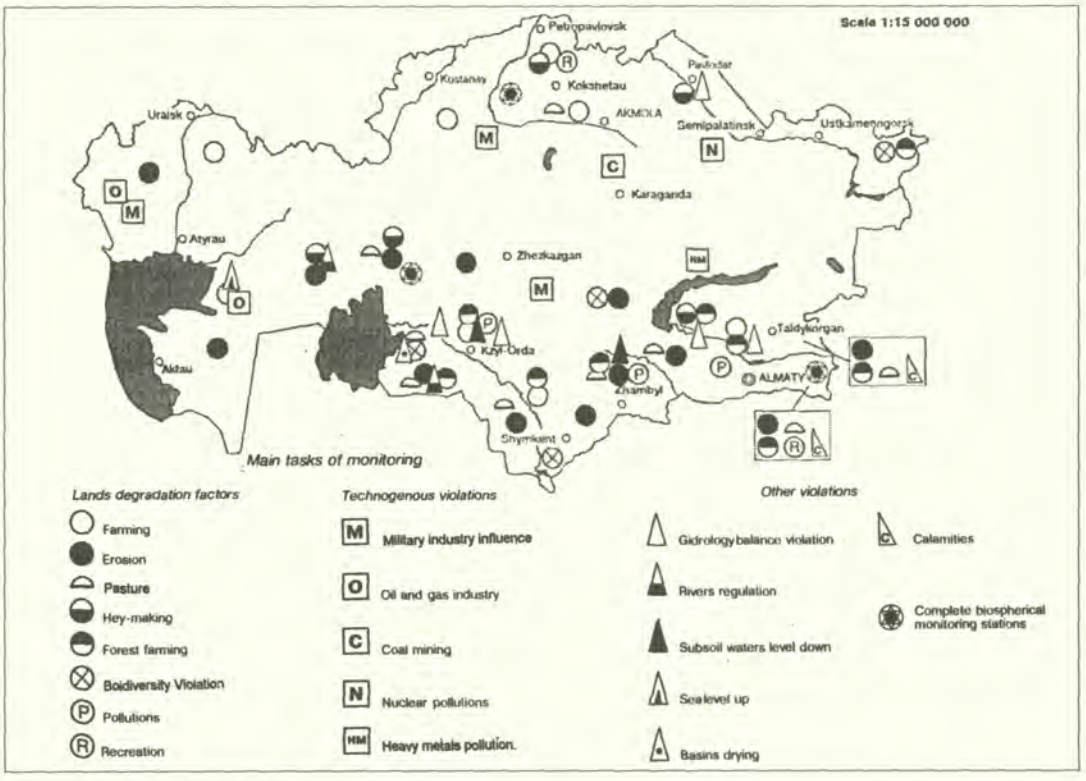


Fig. 3: Recommended desertification monitoring stations.

which would allow for the introduction of certain specifics. The existing catalogues of space image models in black and white and colour film in the visible part of the spectre (0,4-0,75 micro metre) should be improved by increasing scale and density. Desertification monitoring needs more differentiated images for its geometrical and brightness components and also for interpretation of the type of desertification.

The preliminary project of desertification monitoring has been prepared and includes the following: drafting the conception, methods of information collection and observation standardization (tasks, criteria, objects), data base creation in the MEBR of the Republic of Kazakstan, and the addition of the desertification monitoring to the uniform system.

Elaboration of measures on the rational use of natural resources

The main strategic regulations at the local level are defined by legislation which binds all land owners and land users to: provide ecological and economically sensible arrangements for their land, use should take into account natural contours, forest rehabilitation and natural landscapes; land should be protected from water and wind erosion, stone-streams, underground flooding, bogging, second salinization, drying up, compression, contamination and clogging by wastage, chemical substances, from fires and other processes of degradation and desertification. Land reclamation and enhancing of soil fertility, the productivity of hayfields and pastures, and also conservation of the fertile layer of the soil should be encouraged. The conservation and coordinated use of biodiversity according to society's requirements is a national aim and it has to be achieved by the governmental and legislative authorities of Kazakstan.

Partnership arrangements at the national level to implement NAP

In order to achieve the objectives of the NAP and to implement its provisions the government should develop, in a spirit of partnership, cooperation between all levels of government, between communities, non-governmental organizations and land-holders to establish a better understanding of the nature and value of natural resources in affected areas of the republic and to work towards their sustainable use.

Role of Government organs

The role of Government is very great if the successful realization of the National Programme (NP) to combat desertification is to be achieved.

The following measures must be taken for the realization of this Programme:

- The appointment of proper structures (organs), which will be

responsible for the preparation, coordination and fulfillment of the Programme, and for conducting negotiations at sub-regional and international levels;
- An analysis of the environmental condition of affected regions, the estimation of the reasons for recommendations to lessen consequences and to raise the efficiency of soils, the organization of the Committee to combat desertification;
- Selection of priorities to prevent desertification;
- A monitoring system on the processes of desertification;
- The mobilization of financial and human resources to combat desertification.

Local organs of management

The main tasks of local management organs must be:
- To raise awareness among local populations about the degradation and desertification processes, about aims and proposals of the Convention and the Programme;
- To collect information about desertification;
- To take part in the realization of new technological projects on restoring soil efficiency;
- To realize the maximum participation of local populations in the National Programme;
- To take measures in order to improve economic conditions for the eradication of misery; and
- Projects on alternative sources of means of subsistence.

Non-governmental organizations (NGOs)

The United Nations Convention to Combat Desertification attaches great importance to the participation of the NGOs in the fulfilment of its main policies at the local level. In November 1994 an International Network of NGOs was created to combat desertification (RIOD). The network has a the World Centre, ELCI and regional (continental) centres, Pakistan's organization SCOPE was chosen as the centre for Asia.

The main activities of NGOs can be defined as follows:
- Participation in policy planning, implementation and review of the national action programmes;
- Undertaking public awareness programmes;
- Providing the vital link between government and the local population;
- Ensuring with all players the financial mechanisms and resources for NAP implementation;
- Coordination arrangements on NAP implementation at local, national, sub-regional and regional levels;
- Intercommunication with NGOs in different countries in Asia;
- Elaboration of an organizational structure of national NGO networks;
- Establishment of a national centre.

Conclusion

The territory covered by the Republic of Kazakstan is extensive, lying as it does in the centre of Eurasia, from north to south for 2,000 km - from Western Siberia to hot dry deserts and the highest mountains of Middle Asia and from West to East for 3,000 km - from the Volga's steppes to Altai with different climatic conditions and types of desertification. The problem of desertification of Kazakstan's territory is not only national but also interstate. It includes the consequences of activity at the Semipalatinsk nuclear testing ground, the drying Aral Sea, raising level of the Caspian Sea, the activities of army-space complexes.

Kazakstan understands that to combat desertification it is important to develop its economic structure, promote environmental protection and raise living standards.

The National Action Programme to combat desertification in the republic proposes tackling the joint problems of economics and ecology and includes the following:
- Monitoring of desertification by means of the creation of a network of ecological stations which will receive complex information and analyse ecological problems.
- Assessment of desertification and drought and the ecological, economic and social consequences of such in order to adopt adequate measures.
- Assist territories to organize themselves to prevent soil degradation. Protecting pasture land against water and wind erosion, salting, dehumification, pollution and other types of degradation.
- Restoring the fertility of arable lands, rangelands and recultivation lands used for industrial activities.
- Developing a system for the reclamation of territories.
- Elaboration of laws on ecology and national norms in order to prevent degradation of natural ecosystems.
- The ecological study of desertification problems in schools, institutes and universities.
- The realization of concrete regional projects to overcome desertification consequences.

The Programme to combat desertification cannot take into account all regional features and the variety of conditions in Kazakstan, therefore regional strategies will need to be worked out which must become the part of the NAP.

Combating desertification and caring for the preservation of natural resources are issues confronting the whole state. Such problems can be solved with the active participation of the State's administrative, legislative and executive organs as well as with cooperation from NGOs and the local population.

Towards Ecological Regeneration, Biodiversity Conservation and Environmental Restoration of the Thar Desert Ecosystem in India

Rajiv K. Sinha,

Asst. Professor (Human Ecology)Indira Gandhi Centre for Human Ecology,Environment & Population Studies,University of Rajasthan Jaipur (India)-302 004

Pushpa Ghial,

Research Scholar IGC for HEEPS,UOR, Jaipur-302004

Abstract

India after independence made strenuous efforts towards the ecological regeneration of the Thar desert in order to reclaim vast unproductive tracts of desert land. A 649 km long man-made canal was dug to bring sweet Himalayan waters to the water starved Thar desert. Although the Thar desert can turn a lush green after insignificant rainfall, its natural rate of regeneration has been very slow because of intense biotic pressure (overgrazing, extraction of fodder and fuelwood).

The introduction of fast growing exotic species from isoclimatic regions of the world; for the stabilization of shifting sand dunes; for the creation of micro-climates through shelterbelt plantations; and the creation of fencing and enclosures for regeneration of indigenous species have proved highly successful in ecological regeneration and restoration of the Thar desert. The Thar desert ecosystem shows tremendous resilience for regeneration when biotic factors are removed.

The traditional people of the Thar have a grand tradition of preserving village forests and green woodlands *Orans* in the name of local dieties. The villagers take vows not to fell trees or even branches of trees from the *Orans*. Only grasses and palatable herbs can be used as fodder for cattle. *Orans* are like "mini-biosphere reserves" in the barren Thar desert and have greatly helped in the maintenance of ecological stability in the region.

Introduction

The Thar desert occupies about 2.34 million sq. km of hot aridland. It represents one of the most inhospitable arid zones in the world spreading mostly through western Rajasthan, Gujarat, South-Western Punjab, Haryana and part of Karnataka. Eighty-five per cent of the great Indian and arid zone lies in India and the rest in Pakistan. The Aravali hills (older than the Himalayas) intersect the State in the north-east and to the west lies the Thar desert.

Indian aridland is characterized by high velocity rolling sand dunes; high diurinal variations of temperature; scarce rainfall; intense solar radiation and high rates of evaporation. The sandy soils of the desert have rapid infiltration rates of water, poor fertility, low humus content due to rapid oxidation and high salinity. All of which are very hostile to life and yet large human and livestock populations inhabit the area. The Indian desert is extremely fragile with poor primary material and large liabilities.

Archeological evidence suggests that the region was once a flourishing green country-side with thick forest and a well-knit system of rivers of which Saraswati and the Yamuna were the largest. Epigraphic evidence by Landsat Satellite Imagery confirms this. The onslaught of man and his domestic animals on the local ecosystem changed the panorama of the region from a land of plenty to a land of poverty in less than 5,000 years. The vestiges of Mohen-jo-daro and Harappa which stand in the barren desert tells the story of the effects biodiversity destruction and desertification can have on human civilization.

Man started inhabiting this part of the earth in the Palaeolithic and Mesolithic times. The artefacts discovered in the Pushkar and Luni basin of Rajasthan are a clear testimony that ancient man lived here as early as 5,000 B.C. Perhaps, the over-exploitation of land and water resources since the earliest of times made Rajasthan desert a 'man-maintained" if not 'manmade'.

The Thar desert of Rajasthan can, however, become a lush green landscape after the slightest precipitation. The soil is full of dormant seeds of various species which sprout with little moisture.

India after independence paid a great deal of attention to the ecological restoration and regeneration of its arid zones and to this end view a water canal called the Indira Gandhi (IG) Canal was constructed to bring the sweet Himalayan waters to the remote deserts of Rajasthan. The IG Canal has a capacity of flow 524 m^3 of water/sec. With the coming of the canal the Thar desert is changing fast. The desert ecosystem appears to be transforming itself into an ever-green forest ecosystem (Sinha 1990; Ziddi 1990).

Sustainable forestry for ecological regeneration and sustainable development in the Thar desert

A Desert Afforestation Research Station was set up at jodhpur in 1952. Trials on exotic species revealed the usefulness of certain species viz. *Acacia tortilis, Dichrostachys glomerata, Colophospermum mopane and Eucalyptus camaldulensis. Acacia tortilis has* performed very well in sandy areas helping to stabilize sand dunes. Similarly, *Eucalyptus camaldulensis* has done well in the Indira Gandhi Canal Command Area.

The natural regeneration of trees and shrubs in arid regions is very slow and highly time consuming. The biotic pressure is so intense in the arid region of Rajasthan that the forest floor is grazed clean and the plants are browsed severely, hampering the regeneration process (Sharma 1993).

The State forest department made a humble attempt at desert regeneration in 1958 by taking up afforestation on a limited scale in Command Areas of the IG canal in Ganganagar district. Later, during the years 1970-1971 large scale afforestation works were taken up in other desert districts under the Desert Development Programme and Rural Works Programme. The major afforestation programmes implemented were sand dune fixation work; silvipastoral plantations; village fuelwood plantation; shelterbelt plantations; the ecological restoration and rehabilitation of degraded aridland forests; afforestation on barren hills and re-seeding of old pastures and farm forestry. Until 1983, four rupees per plant were provided to farmers in the region as a subsidy for raising plants in their private fields. In addition to this, free saplings were supplied. Now plants raised in nurseries are supplied at a subsidised rate of 10 paise for thorny plants and 20 paise for other plants. Each commune in the desert district has one or more nurseries. In addition, subsidies are being given for decentralised 'Farmer Nurseries'.

An ambitious afforestation programme through the creation of *"Microclimates" is* also under way in the IG Canal Command Area in the arid regions of Ganganagar, Bikaner, Jodhpur and jaisalmer. An Ecological Task Force of the Territorial Indian Army has been carrying out this afforestation drive since 1983.

(a) Introduction of fast growing exotic tree species in the Thar desert

The indigenous tree species growing in the Thar desert are not only few in number but are also extremely slow growing. Therefore, greater attention has focussed on the introduction and selection of fast growing exotic tree and shrub species from isoclimatic regions of the world. About 115 *Eucalyptus* species, 73 *Acacia* species and 170 miscellaneous ones from various countries including Mexico, the United States, Latin America, the former USSR, Israel, Arizona, Peru, Kenya, Australia, Chile, Sudan, Zimbabwe and the middle East were introduced. *Acacia tortilis* an exotic from Israel for sand dune stabilization, *Prosopis juliflora*, suitable for fast biomass production, *Acacia nubica* for sand dune stabilization, *Colophospermum mopane and Dichrostachys glomerata* for fodder purpose and *Eucalyptus camaldulensis* are a few exotics suited for low rainfall areas. A number of exotic tree species such as *Eucalyptus comaldulensis, E. tertninalis, E. melanophloia, Acacia tortilis, A. cillata, A. raddiana, A. senegal, A. sieberiana, A. aneura, A. salicina, Colophospermum mopane, Dichrostachys glomerata, Brasiletta millis, Schinus molis and Prosopis juliflora* have proved very promising in the Indian desert. Of all the exotic species tried, *Acacia tortilis* from Israel has been adjudged the best fuel-cum-fodder species and when felled in the tenth year of its planting, is estimated to yield 40 tones of air dry fuel per hectare. Since its introduction, it has found a niche not only in the Rajasthan desert but also in other states in India. *Acacia tortilis* whose growth performance and survival has been equal to or better than the indigenous *Acacia senegal* has been designated as very promising (Muthana & Arora 1973).

Acacia salicina, Acacia aneura, Brasilletta mollis, Hardwickia binata and *Colophospermum mopane* have been identified as fodder trees most suited to the 300-350 mm rainfall zone. *Dichrostachys glomerata* has been adjudged the most suitable species for the reclamation of wastelands in view of the

Table 1
Promising exotic species of *Acacia* for the Thar desert in India

Species introduced into the Thar desert	Country of origin	Survival percentage	Mean Annual Increment Ht (cm)	DBH (cm)
A. tortilis	Israel	100	45.7	1.2
A. raddiana	Israel	100	44.8	1.0
A. senegal	Kenya	16	32.3	1.4
A. ciliata	Israel	50	61.8	0.5
A. aneura	Australia	85	34.7	0.4
A. salicina	Australia	100	26.8	0.5

Source: Report of CAZRI, 1988

profuse root suckers produced by this plant. *Casuarina cristata, Grevillea pterosperma, Myporum montanum, Zizyphus spinachristi, Schinus molle,* etc. have also shown great promise (table 1).

In general, the performance of *Eucalyptus camaldulensis* and E. *tenninalis* was found to be better than any other *Eucalyptus* species. *Acacia tortilis* has proved to be the most promising introduction having a mean annual increment rate in height and DBH around 78 cm and 1.1 cm at Jodhpur and 77.2 cm and 0.7 cm at Pah, respectively. However, the farmers of Thar are not able to accept this tree as its undergrowth of arable crops has not been comparable with that under *Prosopis cineraria.*

Among the species of other genera which have the potential to adapt to the climatic conditions of Thar are shown in table 2.

(b) Afforestation, for the stabilization of shifting sand dunes.

In low rainfall areas (150 mm to 400 mm), shifting dunes are common particularly near habitations. Techniques of afforesting the shifting dunes were standardized after 10 years of experimentation. These techniques consist of (i) Protection against biotic interferences; (ii) Treatment of shifting sand dunes by fixing barriers in parallel strips or in a "chess-board" design, using local shrub material starting from the crest down to the heel of the dunes to protect the seedlings from burial or exposure by blowing sand; (iii) Afforestation of such treated dunes by direct seeding and planting. The two species commonly used for erecting brushwood barriers (Micro-windbreaks) are *Zizyphus nummularia* and *Crotalaria burhia* (Kavia & Harsh 1993).

The indigenous and exotic species which have proved successful in sand dune stabilization are: trees - *Acacia senegal, Prosopis juliflora, Albizzia lebbeck, Cordia rothii, Dalbergia sissoo* (in regions with mean annual rainfall of 250 mm) and Zizyphus jujube; shrubs - *Calligonum polygonoides, Cassia auriculata, Ricinus communis* and *Zizyphus* nummularia; grasses *Lasiurus sindicus, Panicum* turgidum and *Erianthus* munia- Among exotic species, *Eucalyptus oleosa* (Australia), *Acacia tortilis* (Israel), *Parkinsonia aculeata* and *Acacia victoriae* (Australia), *Acacia albida* (Middle East) were found to be very promising, especially, as these species were found to be frost-resistant. *Acacia albida* was used to stabilize 60,000 hectares of sand dunes in the Thar Desert.(Anonymous 988).

Calligonum polygonoides is a very useful species of the Thar desert, it is a naturally growing sand dune shrub. It has a massive network of underground roots which work as effective sand binders. Other species occurring on sand dunes are *Aerva psuedotomentosa, Leptadenia pyrotechnics, Citrullus* colocynthis, Lasiurus sindicus, Calotropis procera, and yet other suitable species for planting on sand dunes are *Colophospermum mopane and Prosopis cineraria.*

(c) Promising salt tolerant tree species for the Thar desert

Of the different tree species tested for their tolerance and suitability for and semi-arid conditions, saline water irrigation and soil salinity, *Prosopis juliflora, Tamarix articulate, Acacia tortilis and Chenopodium spp.* were highly tolerant (table 3).

(d) Shelterbelt plantations

Shelterbelts consisting of a row of trees viz. *Acacia tortilis, Tamarix articulata and Azadirachta indica* flanked by two rows (one on each side) of smaller trees such as *Acacia senegal, Prosopis juliflora* etc. with two rows (one on each side) of shrubs such as *Aerva tomentosa, Ziziphus spinachristi, Calligonum polygonoides* were found to be very effective in the Thar desert. Shelterbelts reduced the wind velocity by 20 to 46 per cent on the leeward side up to a 2H to 10H range during the monsoon period (H = height of shelterbelt).

Soil loss was also considerably reduced. The Rajasthan State Forest Department has so far covered about a 38,000 km under shelterbelt, roadside, railway line and canal side plantations since 1978 by adopting the technology developed at CAZRI, Jodhpur (Kaul 1969).

(e) Silvipasture development in the Thar desert of Rajasthan

Among nine tree species tried, *Acacia tortilis* showed a survival rate of 98 per cent, followed by *Dichanthium nutans (88 per cent), Acacia senegal* (83 per cent) and *Acacia indica* (65 per cent), whereas *Prosopis cineraria and Albizzia lebbeck* showed only a 5 to 10 per cent survival rate. *Hardwickia binata, Colophospermum mopane and Ziziphus nummularia* showed a 28 to 35 per cent survival. Maximum height recorded for *A. tortilis* was 290.54 cm, followed by *A. indica* 239.66 cm and *A. senegal* 175.24 cm and the lowest for *P. cineraria* 77 cm. The collar diameter recorded in *A. tortilis, A indica* and *A. senegal* was 8.21, 6.88 and 4.46 cms respectively.

Table 2

Performance of certain promising exotic species in the Thar desert of Rajasthan

Species introduced into the Thar Desert	Country of origin	Survival Percentage	Mean Annual Increment Ht (cm)	DBH (cm)
Prosopis juliflora	Israel	31	65.8	1.7
Prosopis juliflora	Chile	33	46.1	1.2
Brasiletta mollis	Italy	100	41.0	0.5
Colophospermum mopane	Zimbabwe	83	29.3	0.6
Ziziphus spinachristics	Israel	100	17.9	0.4
Dichrostachys glomerata	Israel	91	21.5	0.4

Source: Report of CAZRI, 1988

Table 3

Tolerance limits of different tree species to saline water irrigation and soil salinity

	Very high	High	Medium	Low
Soil V Irrigation water	> 16 mmhos 9-6 mmhos	16-8 mmhos 6-3 mmhos	8-4.0 mmhos 3-0.6 mmhos	upto 4.0 0.6 mmhos
	Prosopis juliflora	*Eucalyptus camaldulensis*	*Azadirachta indica*	*Cassia sianwa*
	Tamarix articulata	*Eucalyptus hybrid*	*Acacia aneura*	*Albizzia lebbeck*
	Acacia tortilis	*Leucaena leucocephala*	*Colophospermum mopane*	
		Chenopodium spp	*Dichrostachys glomerata*	

Source: Report of CAZRI, 1988

Dry forage yield of *Cenchrus setigerus* in the interspaces between the trees was 2,020 kg/ha in the plots of *A. tortilis* and 2,500 kg/ha in *A. indica*. Dry forage yield of grass under other tree species ranged from 2,750 to 2,980 kg/ha as against 3,000 kg/ha under pure pasture without trees.

Cenchrus ciliaris (CAZRI-3581) and *Cenchrus setigerus* (CAZRI-175) were sown between rows of neem *(Azadirachta indica)*, subabool *(Leucaena leucocephala)* and Israeli babool *(Acacia tortilis)* planted in 1988 at 5 m x 5 m spacing. The growth of trees was reduced, but growth of grasses was better under the system. The fodder yield was more under *Azadirachta indica* as compared to grass under *Leucalna leucocephala* and *Acacia tortilis* (Anonymous 1993) (Table 4).

(f) Genetical improvement of desert trees through genetic variability

Genetical improvement work on *Prosopis cineraria* and *Tecomella undulate*, two native species of the Thar desert of Rajasthan, is in progress at CAZRI. In *P. cineraria* out of eleven progenies, PC 5 attained a height of 2m and above in a period of three years. Under field conditions, *P. cineraria* grows relatively slowly (i.e. it attains a height of 60 to 80 cm only after a period of three years).

Two strains of *Prosopis cineraria* (PC 4 and PC 5) have recently been identified as fast growing trees having clean boles, less gall formation and relatively smaller spines. These trees attain greater heights than *Acacia tortilis* trees of the same age. The technology for the production of genetically uniform seeds of *Prosopis cineraria*, using the air-layering technique has been developed. A rooting hormone - Seradix B 3, has been used in the process. Nursery techniques for raising seedlings of both indigenous and exotic tree species have been developed at CAZRI, Jodhpur. Under rainfed conditions transplantations of 6 to 9 month old seedlings have given significantly better performance than direct seeding at site. In arid regions younger seedlings successfully withstand the physical limitations and impact of the arid environment.

The indigenous species are, however, best adapted to the local conditions. The valuable indigenous tree species are *Prosopis cineraria, Acacia senegal, Tecomella undulate, Albizzia lebbeck, Salvadors oleoides and Azadirachta indica*. The only problem is their excessively slow growth rate. For example, in 14 years *Prosopis cineraria, Acacia senegal and Tecomella undulata* attained a height of 2.8, 3.5 and 3.1m respectively.

Table 4

Yield of forage (Kg/ha) under different trees

Tree	*Cenchrus ciliaris*	*Cenchrus setigerus*
Control	2,570	2,100
Azadirachta indica	4,350	3,430
Leucaena leucocephala	3,100	2,570
Acacia tortilis	2,720	2,950

Source: Annual Report of CAZRI, Jodhpur. (1992-93)

(g) Silvicultural suitability of some trees for the Thar desert of India

Acacia leucophloea, Acacia auriculiformis, Acacia nilotica, Acacia senegal, Acacia tortilis, Albizzia lebbeck, Cassia siamea, Casuarina equisetifolia, Dalbergia sissoo, Derris indica, Parkinsonia aculeata, Pithecollobium dulce, Prosopis cineraria, and *Prosopis chilensis* are some of the important multipurpose "nitrogen fixing" trees recommended in different habitats of the Thar desert (Sivaji et.al. 1993).

Earlier experience has shown that exotic species such as *Prosopis juliflora, Acacia tortilis, Eucalyptus spp.* etc. have exhibited good growth rates and have naturalised in this area. *Atriplex* species can be grown on saline and alkali soils. The species which have shown promise are *Eucalyptus camaldulensis, Eucalyptus terminalis, Acacia aneura, Acacia*

raddiana, Colophospermum mopane, Dichrostachys glomerata

Whether the species is evergreen or deciduous is an important point in the selection for desert afforestation. As wind velocity can be reduced by foliage evergreen trees are likely to play an important role.

Acacia auriculiforinis, Acacia nilotica, Derris indica, Cassia siamea and Pithecollobium dulce are evergreen trees. *Prosopis cineraria* and *Prosopis chilensis* are semi-evergreen to evergreen and they may remain leafless for very short periods. *Acacia leucophloea, A. senegal, Albizia lebbeck and Dalbergia sissoo* are deciduous trees.

Acacia leucopholea, Acacia senegal, Acacia tortilis, Prosopis chilensis and Prosopis cineraria are able to grow in areas where rainfall is less than 400 mm. *Acacia auriculifortnis, Acacia nilotica, Albizia lebbeck, Dalbergia sissoo, Derris indica, Pithecollobim dulce, Parkinsonia aculeata* and *Cassia siamea* grow in areas where the rainfall is more than 400 mm. The ability to withstand drought varies from species to species. *Acacia leucophloea, Acacia tortilis, Dalbergia sissoo, Parkinsonia aculeata, Prosopis cineraria* and *prosopis chilensis* are highly drought resistant. The drought resistance of *Acacia nilotica* differs from place to place and ranges from moderate to high. *Acacia senegal* is highly drought resistant, *Acacia auriculiformis, Derris indica, Leucaena leucocephala, Pithecollobium dulce and Cassia siamea* are moderately drought resistant.

Coppicing ability is another silvicultural requirement of the species selected for afforestation in arid zone. This is particularly important if the species is raised for fuelwood production. *Acacia leucophloea, Acacia senegal, Albizia lebbeck, Dalbergia sissoo, Derris indica, Pithecollobium dulce, Cassia siamea are* good *coppicers. Prosopis chilensis* and *Prosopis cineraria* are fairly good coppicers.

(h) Fruit tree plantation in desert development

Some fruit plants have adapted themselves to the Thar desert. Among those, suitable for afforestation/ reforestation are:

Jujube (Ziziphus mauritiana), Custard apple *(Annona squamosa; A. cherimoya A. atemoya; A. reticulata)*, Pomegranate *(Punica granatum)*, Aonla *(Emblica officinalis)*, Strawberry *(Syiygium cumini)*, Karonda *(Carissa carandes)*, Fig (*Ficus carica*), Phalsa *(Grezvia asiatica)*, Guava *(Psidium guajava)*, Tamarind *(Tamarindus indica)*, Wood apple *(Aegle marmelos)* (Kumar & Kumar 1993).

These fruit crops qualify for planting in desert conditions owing to their deep tap root system which grows fast. The cell sap is very thick which makes them less prone to desiccation during hot weather. In severe drought conditions shoot tip abscission sets in arresting vegetative growth to overcome stress. These fruit crops also undergo a dormancy period unlike evergreen fruit crops. Some varieties of pomegranate also exhibit this tendency. The second major consideration which makes these fruit plants fit for afforestation or reforestation is their fuelwood yield. Experiments conducted at CAZRI, Jodhpur in a pruning trial of Jujube *(Ziziphus)* and Phalsa *(Grewia)* revealed that 4 to 8 tones of wood/ha can be obtained from these crops. Besides this wood, average fruit yields of 100 kg and 1.2 kg per plant can be reaped respectively. The third qualifying character of these and zone fruits is the fodder value of leaves. Some of the crops such as *Ziziphus, Syzygium* and *Tamarindus* produce nutrient rich foliage and seeds fit for bovine consumption.

Among these fruit crops, *Ziziphus* has another advantage. It is an excellent host plant for the lac insect *(Kerria lacca)* and tassar silk worm *(Antheraea pappia)*. Tassar silk moths do not mate under captivity and hence caterpillars cannot be domesticated. But cocoons can be collected from wild berry plantations which yield reliable silk provided harvesting is done before the emergence of moth. Crops such as *Grewia* also act as secondary hosts. The lac yield varies from 1.20 kg to 15.0 kg/tree depending on inoculum.

In view of all these advantages of food, fodder and fuel generation which is the main aim of any afforestation programme, and zone fruit crops assume a great importance in Thar desert afforestation.

Some eco-restoration programmes undertaken in the Thar desert

Ecological restoration and regeneration of the Thar desert for sustainable development was initiated in May 1970.

The programme involved : -

(i) Rehabilitation of forests on hills (12,500 ha);
(ii) Grassland development for fodder banks (2,000 ha);
(iii) Development of pastures (6,000 ha);
(iv) Reclamation of saline soils (3,000 ha); and
(v) Wind break plantations (5,000 km of rows).

The scheme for the rehabilitation of forests on hills has covered a considerable area with *kumat (Acacia senegal), dhoora (Anogeissus pendula)* and bushes to protect against grazing and browsing. The trees are now reestablished and the ground is covered with grasses and bushes. The resulting scrub forest has provided fuelwood (from dead and dry fallen wood) as well as grass and grazing facilities. On a rotation of 40 years, each hectare will yield 200 quintals of fuelwood. In addition, two quintals of fodder grass is made available annually from the fifth year.

Under the scheme for the development of pastures, controlled and rotational grazing has been introduced. Some of the areas have been reseeded with perennial and nutritive grasses such as *dhaman (Cenchrus ciliaris), kala dhaman (Cenchrus setigerus), karad (Dichanthium annularum)* and *sewan (Lasiurus sindicus)*- Moreover, in some of the pastures various top feed species have been planted.

The programme for the reclamation of saline soils was intended to convert these lands into productive lands for cultivation by planting salt resistant plant species. *Vilayeti babul (Prosopis juliflora)* and *deshi babul (Acacia nilotica)* are now fairly well established. Windbreaks in multiple rows of suitable tree species of *vilayeti babul (Prosopis juliflora), Israeli babul (Acacia tortilis), neem (Azadirachta indica)* and *siris (Albizzia lebbeck)* are being planted along

Table 5
Time limits of natural regeneration of the vegetation in various arid habitats of the Rajasthan desert

District	Rainfall (mm)	Land form in the Thar desert	Soil texture	Duration of protection (in years)	Grass cover cover	Tree/Shrub	Recommended protection (years)
Pali	450	Hill	Gravelly	10	*Chrysopogen fulvus*	*Acacia senegal*	5
Jodhpur	250	Hill (top)	Gravelly	20	*Aristida, Dropstium*	*Acacia senegal*	15
Jodhpur	250	Hill (slope)	Gravelly	20	*Aristida depressa*	*Acacia senegal*	12
Jodhpur	250	Hill (base)	Gravelly	18	*Eleusine compressa*	*Maytenus spp.*	6
Jodhpur	250	Flat-buried	Loamy loamy pediments	18	*Dichanthium, Chenchrus*	*Prosopis, Zizyphus*	6
Pali	450	"	"	18	*Eremopogon, Aristida*	*Prosopis, Capparis*	6
Binaker	450	"	"	20	*Cenchrus, Aristida*	*Capparis*	6
Jaisalmer	150	Sandy undulating buried pediments	Sandy	20	*Lasiurus sindicus*	*Haloxylon salicornicum*	7
Pali	150	Flat aggraded older alluvial plain	Clay loam	18	*Cenchrus spp. Zizyphus*	*Prosopis juliflola*	5
Sirohi	450	Flat aggraded older alluvial plain	Clay loam	18	*Dichanthium annulatum*	*Acacia leucophloea, Acacia nilotica*	5
Barmer	200	Sandy undulating aggraded older	Sandy alluvial plain	18	*Cenchrus spp.* Bikaner	*Prosopis, Zizyphus*	8
	250	Sandy undulating aggraded older	Sandy	20	*Lasiurus sindicus Cymbopogon,*	*Prosopis, Zizyphus Cenchrus*alluvial plain	7
Sikar	450	"	"	18	*Cenchrus*	*Prosopis, Acacia Leucophloea*	7
Bikaner	250	Sand dune (slope)	"	20	*Aristida, Cenchrus*	*Calligonum polygonoides*	8
Bikaner	250	"	"	20	*Aristida*	*Calligonum polygonoides*	8
Bikaner	250	" (base)	"	20	*Panicum antidotale*	*Calligonum polygonoides*	8
Jodhpur	250	Shallow	Clay loam	20	*Sporobolus marginatus*	*Prosopis juliflora*	5

Source: K. A. Shankarnarayanan in Ishwar Prakash (Ed.) "*Desert Ecology*" (1988)

Table 6
Time sequence of regeneration of vegetation in various arid habitats in the Rajasthan desert

Desert Habitats	Duration of enclosure (in years)	Grass cover	Tree/Shrub cover
Hills	7	*Chroysopogon fulvus, Eremopogon foveolatus, Heteropogon contortus*	*Acacia senegal, Maytenus emarginetus Zizyphus nummularia*
Rocky/gravelly pediments	12	*Eleusine compressa Dactyloctenium sindicum*	*cacia senegal, Balantis aegyptiaca, Maytenus emarginatus, Z. nummularia*
Rocky gravelly pediments with contour bunding	6	*Eleusine compressa Dactyloctenium sindicum*	*Acacia senegal, Balantis aegyptiaca, Maytenus emarginatus, Z. nummularia*
Flat buried pedients (high rainfall and heavy soils)	6	*Dichanthium annulatum*	*Salvadora oleoides, S. persica, Z.nummularia, prosopis cineraria, Capparis decidua*
Sandy undulating buried pediments (low rainfall)	6	*Lasiurus sindicus Panicum antidotale*	*Haloxylon salicornium, Z. nummularia, Leptadenia pyrotechnica*
Flat aggraded older alluvial plains	4 to 6	*Lasiurus sindicus Panicum antidotale*	*Haloxylon salicornium, Z. nummularia, Leptadenia pyrotechnica*
Sand dunes	18	*Panicum turgidum Cenchrus prieurii*	*Calligonum polygonoides, Saricostema pauciflorum*
Shallow saline Depressions	6	*Sporobolus marginatus Dichanthium annulatum*	*Prosopis juliflora, Acacia nilotica Capparis decidua*

Source: K. A. Shankarnarayanan in Ishwar Prakash (Ed.) "*Desert Ecology*" (1988)

all important roads, railway lines and around tubewells.

In jaisalmer district, schemes have been launched for the cultivation of green fodder over 200 hectares, pasture development over 3,000 hectares and the raising of one hundred wood lots and nurseries. Investigations have confirmed the existence of aquifers which have the potential of an average discharge of 150,000 litres per hour. Exploitation of this groundwater is expected to help extensive agriculture, horticulture and silviculture in this area. The Government of Rajasthan had undertaken a pilot project for fodder production on 300 hectares and pasture development on 750 hectares.

Ecological regeneration through the creation of micro-climates in the Thar desert

The main strategy of ecological regeneration in the Thar desert is through the creation of "micro-climates" by planting of shelter-belts and wind breaks to reduce the hazards of dry hot wind and blowing sand dunes. For this purpose fast growing *Eucalyptus* trees have been utilized with great success. With the availability of canal water, thick rows of *Eucalyptus* trees have been grown in selected pockets and the area within the *Eucalyptus* micro-climate has been developed for the purpose of further afforestation by adapted species of economically important trees. Several micro-climatic zones have been converted into agricultural farms after treatment of the soil by animal manure and compost over successive years. Wheat, sorghum, groundnut, lemon, kino, malta, guava, ber and cotton are being raised with great success in the micro-climates (Sinha, 1993). The trees planted within the micro-climates, are *siris (Albizzia lebbeck), kumat (Acacia senegal), deshi babool (Acacia nilotica), Israeli babool (Acacia tortilis),* and the desert timber trees, *rohira (Tecomella undulata)* and *ardu (Ailanthus excelsa),* the revolutionary fuelwood plant *su-babul (Leucaena leucocephala)* and the multipurpose tree *khejri (Prosopis cineraria)* known as the "tree of eternity" to the desert people. *Shisham (Dalbergia sissoo)* and neem *(Azadirachta indica)* have also been planted on a large scale with great success. Such pockets of "man-made forests" with deer and black buck frequently dot the barren desert along the I.G. Canal which has largely helped in arresting the evils of desertification as well as assisting in ecological regeneration of the desert (Sinha 1993).

Another significant achievement is the mass production of nutritive fodder in the form of sewan grass *(Lasiurus sindicus)* for desert livestock. The revolutionary grass has significantly helped in stabilizing the blowing sand dunes and preventing expansion of the desert. Fuelwood and fodder production in the Thar desert has had a positive impact on arresting desertification and ecological regeneration. It is due to over-exploitation of fodder and fuelwood - the two basic necessities of life for the desert people which is causing ecological destruction of the desert ecosystem and further desertification. Large scale afforestation works to create micro-climates in the Thar desert of Rajasthan have been undertaken by the State forest department in cooperation with the ex-servicemen of the Territorial Indian Army known as the "Ecological Task Force".

Ecological regeneration in the Thar desert through fencing and enclosures

Scarce vegetation in the Thar-desert in Rajasthan needs to be protected, and utilized scientifically and sustainably. One of the strategies adopted for this purpose is the protection of degraded habitats through enclosures for a certain period of years. A chain of long term enclosures has been established on a variety of desert habitats by CAZRI research centres. Natural regeneration obtained from a study of enclosures in desertic habitats namely - (1) Hills; (2) Rocky, gravelly pediments; (3) Flat buried pediments; (4) Sandy undulating buried pediments; (5) Flat aggraded older alluvial plains; (6) Sandy undulating aggraded older alluvial plains; (7) Sand dunes; and (8) Shallow saline depressions have been studied for eco-regeneration and are summarized in Tables 5 and 6.

It was observed that the degraded Thar desert habitats showed tremendous resilience for regeneration when the biotic factor was removed. This absence triggered off a progressive ecological succession in grass cover, tree/shrub cover, which quickly attained a stage of sustainable utilization. The recommended duration of protection is as low as five years for flat aggraded older alluvial plains for *Cenchrus ciliaris, Prosopis cineraria - Zizyphus numularia and Dichanthium annulatum, Acacia leucopholea A. nilotica* in Pali /Sirohi districts to about 15 years for *Acacia senegal Aristida depressa* in Hill land forms in Kailana, Jodhpur. The protection of degraded vegetation through simple enclosures in desert habitats, can lead to an improvement of the grass cover as well as regeneration. The development of vegetation was, however, slow under natural conditions and could possibly be enhanced through soil and moisture conservation and re-seeding and revegetation measures (Shankaranarayan 1988).

In the command area along the I.G. canal in the Bikaner districts of Rajasthan, tremendous efforts have been made, by the State Forest Department to regenerate *phog (Calligonum polygonoides)* through the establishment of fences and enclosures and it has been a great success. *Phog* has proved to be a very useful species in the ecological restoration and stability of the Thar desert ecosystem.

Ecological conservation and regeneration through faith and tradition in the Thar desert

In earlier days, each and every desert settlement had well guarded common property land resources such as water storage and catchment areas called *'Paithan'*; good pasture land called *'Gochar'*, and natural woodland called 'Oran'. The 'Orans' or 'Dev vans' (Forests of God) were designated to honour village dieties or saints and are preserved meticulously on socio-religious grounds. It is like a mini biosphere reserve for the village and the propagules released from these Orans help regenerate vegetation in

other areas (Nathawat & Thakur 1993).

The species protected in the Orans are mostly *Ziziphus nummularia. Ziziphus maurtiana, Acacia senegal, Acacia nilotica, Propsopis cineraria, Tecomella undulate, Ailanthus excelsa,Anogeissus pendula, Salvadors oleoides, Salvadora persica, Boswellia serrata, Azadirachta indica, Butea monosperna,* and *Ficus religiosa.* The traditional people of Western Rajasthan have the grand tradition of preserving these village forests and green woodlands, in the name of a local god or goddess. There are temples of local deities in the Orans. The Oran of Karan jee, in Deshnok, Ramdeo jee in Ramdeora, Goga jee in Barmer, Bhadaria Rai jee, Degrai jee and Devi Kot in jaisalmer are a few of the important sacred groves or forest patches surviving in the desert districts of Rajasthan, largely due to human faith. The cutting of trees is completely prohibited in these Orans as the god and goddess would become unhappy and the whole village would be punished by some natural calamity, e.g. severe drought or flood. The villagers take a vow and promise not to fell any tree or even cut branches of trees from the Orans. Only the grass and other underground palatable herbs can be used as fodder for cattle. As compared to 'Paithan" and 'Gochar', orans are less degraded, as they still maintain the original vegetation of the area. Even dry wood or a dry plant are not removed from many places due to the fear that the diety or the saint will be displeased and may bring wrath to the village. Legend says that the villagers were badly punished for cutting ber plants *(Zizyphus jujuba)* from the oran of 'Bhadaria Rai' in jaisaimer. The villagers prayed for forgiveness in the temple of the oran and also planted and worshipped *Zizyphus* and *Salvadors* to escape the wrath and anger of the deity. Happiness, peace and tranquility returned to the village afterwards (Sinha 1995).

Another legend has it, that some 300 years ago, in 1787, about 368 people, male and female, from the Bishnoi community of Rajasthan, sacrificed their lives in order to save the local *Khejri* trees *(Prosopis cineraria)* in Khejarali village in the Jodhpur district of Rajasthan. They hugged the trees to prevent the army of the then Maharaja from felling the trees for fuelwood for firing lime kilns. The origin of the modern "Chipko Movement" in India can be traced back to those days. The woman who inspired such action, and who made the supreme sacrifice for ecological conservation Amrita Devi, will be remembered by mankind for centuries to come. Even today, the Bishnois vigilantly protect not only the *Khejri* trees, but also black buck, gazzella, blue bull and peafowl around their villages.

Ecological regeneration through aerial seeding

Aerial seeding of *Cenchrus ciliaris, Acacia tortilis* and *Colophospermum mopane* has been carried out at two sites over 56 hectares of military ranges in the Barmer district of Rajasthan. The programme, undertaken in collaboration with the military involved the sandy plain of Jahpa and the rocky hill ranges of Jasai village. Two methods of seeding, i.e. seeding by helicopter and manual broadcasting of pellets were used. Data on establishment and growth were recorded twice, i.e., at sowing and maturity stages. The manual broadcasting of pellets was found to be better than aerial seeding by helicopter. Under controlled conditions in jasai, the plant population in the sandy and rocky areas was six and three individuals per square metre respectively. The controlled sites were seeded manually (Anonymous 1995).

In Jalipa, where seeding was done by helicopter, the plant population was only 1.5 individuals. The corresponding value for the rocky terrain of jasal was 2.5 individuals m^2. The cover of aerial seeded species at sandy Jalipa and rocky jasal was in the order of 132 cm^2 and 125 cm^2, respectively. In general, at both locations, plant height and cover increased in comparison to the values obtained for the same parameters during earlier survey. Tree species, particularly *Colophospermum mopane* completely vanished from the area as animals browsed and grazed out the land. *Acacia tortilis* growth is also sparse.

Aerial seeding was also done in Bikaner on the left bank of the Rajasthan Canal in Sardarpura (300 ha) and Motigarh (400 ha). The seed mixture consisted of seeds of *Acacia tortilis, Clophospermoum mopane, Dichrostachya nutans, Prosopis cineraria, Zizyphus rotandifolia, Citrullus colocynthis and Lasturus sindicus* at a rate of 14 kg/ha. *A. tortilis* recorded the highest germination and seedling density followed by *C. colocynthis* (Anonymous 1995).

Ecological restoration and regeneration of mined wastelands in the Thar desert of Rajasthan

Two mined wastelands, one of gypsum and the other of limestone were selected for rehabilitation work. Four plots of one hectare each were demarcated to have four treatments, i.e. control, development of micro-catchment area, half moon structure development and the introduction of a ridge and furrow system, so that the planting pits (60 cm) could receive additional rain water as runoff. Seven indigenous and exotic species of trees and four of shrub were selected for plantation. In general 5m x 5m spacing, plant to plant and row to row was adopted. The plant species included *Salvadors oleoides, S. persica, Acacia tortilis, Azadirachta indica, Prosopsis juliflora, Tamarix articulata, Pithecelobium culca, Dichrostachys nutan, Cassia stnitii', Cecidium floridum and Caesalpinnea ceraria* (Anonymous 1995).

The rooted slips of grasses such as *Cenchrus ciliaris, C. setigerus* and *Cymbopogon jwarancusa* were also transplanted as a single row in the ridge and furrow system. One and half hectares of mining muck heaps and rocky substrata were used for plantation. The muck heaps were reshaped to create slopes and inverted terraces for rainwater harvesting. At the rocky site "half-moon" structures were developed with 3m and 5 m spacing. Here six tree species and three shrub species, including *Acacia senegal, A. tortilis, Bauhinia racemosa, Prosopis juliflora, Azadirachta indica, Dichrostachys nutan* and *Commiphora wightii* were planted. More than 90 per cent of the plants survived. Live hedges and biofences of *P. Juliflora* were raised with 1 x 1 m spacing to protect the plantation.

Acknowledgements

The author is grateful to the personnel of the State Forest Department of Rajasthan and the Territorial Indian Army based in the desert districts of Rajasthan and also to the scientists working at CAZRI, Jodhpur, for providing the necessary information during field visits to the Thar desert.

References

Anonymous (1988): Progress in Arid Zone Research 1952-86"; Publication of Central Arid Zone Research Institute (CAZRI), Jodhpur, 1988.

Anonymous (1993): *"Annual Report of Central Arid Zone Research Institute"*, (CAZRI) 1991-92, Jodhpur,India.

Anonymous (1995): *"Annual Report of Central Arid Zo)ie Research Institute"*, (CAZRI), 1992-93, Jodhpur, India.

Kaul, R.N. (1969): "Shelterbelts to -stop Creep of the Desert"; *Science and Culture*. 24: '406.

Kavia Z.D. & L.N. Harsh (1993): "Proven technology of Sand dune stabilization - A step to combat desertification. "Proceedings of National Seminar on afforestation of Arid Lands, Institute of Arid Zone forestry Research (IAZFT) Government of India, Jodhpur.

Kumar, B. Prasanna & P. Sampath Kumar (1993): "Role of fruit plants in afforestation of and lands"; In Proceedings of National Seminar on "Afforestation of Arid Lands", Institute of Arid Zone Forestry Research (IAZFR), Government of India, Jodhpur.

Muthana, K.D. & G.D. Arora (1993): *"Acacia tortilis* - A promising fast growing tree for Indian arid zone"; CAZRI Technical Bulletin, No. 5, Jodhpur.

Nathawat, G.S. & Laxmi Thakur (1993): "Regeneration of Degraded Property Land Resources in Rajasthan"; In Dwivedi & Gupta (Edit) *"Afforestation of Aridlands"*, Scientific Publishers, Jodhpur India.

Shankaranarayan K.A. (1988): "Ecological Degradation of the thar Desert and Ecoregeneration"; In Ishwar Prakash (Edit) "Desert Ecology", Scientific publisher, Jodhpur (India).

Sinha, Rajiv K (1990): *"Ecological Restoration of the Aridlands and Future Prospects"*, Paper presented at the National Workshop on Arid Wastelands, Human Resource Potential and Future Development", Indira Gindhi Centre for HEEPS Rajasthan University, Jaipur; May 4-6, 1990.

Sinha, Rajiv K. (1993): "Taming the Thar Desert of Rajasthan (India)"; *Desertification Control Bulletin*, UNEP Publication, Nairobi, Kenya, No. 22, pp. 31-35.

Sinha, Rajiv K. (1995): "Biodiversity Conservation through Faith and Tradition in India - Some Case studies; *"International Journal of Sustainable Development and World Ecology"*, UK, Vol. 2, No.4 pp. 278-284.

Sivaji V., O.N. Pandey & Pawin Kumar (1993): "Multipurpose Nitrogen fixing trees for arid zone afforestation"; In Proceedings of National Seminar on "Afforestation of Arid Lands, Institute of Arid Zone forestry Research (IAZFR), Government of India, Jodhpur.

Solanki, K.R. (1993): Genetic Improvement of Tree Species Suitable for Arid Zone; In Proceedings of the national Seminar on Afforestation of Aridlands, Institute of Arid Zone, Forestry Research, (IAZFRI), Goernment of India

Sharma, Rajendra (1993):"Management of Natural Vegetation - An Imperative for the Ecostability of the Arid zones"; In Proceedings of National Seminar on "Afforestation of Arid Lands" Institute of Arid Zone Forestry Research (IAZFR), Government of India, Jodhpur.

Ziddi Suraj (1990): "Thar Desert Returning to Flourishing Past", - A Field study Report submitted under Dr. R.K. Sinha for PG Diploma in Human Ecology, Indira Gandhi Centre for Human Ecology, Environment and Population Studies, University of Rajasthan, Jaipur.

Stakeholders' Participation in the National Action Programme (NAP) Process: Options and Strategies in Various Socio-Political and Geographic Conditions[1]

D. A. Marongwe

c/o Intermediate Tech,
Development Group,
P O Box 1744,
Harare, Zimbabwe

Executive Summary

The United Nations Convention to Combat Desertification (CCD) was adopted in Paris on 17 June 1994 and came into force on 26 December 1996. The objective of the Convention is "to combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification, particularly in Africa, through effective action at all levels, supported by international cooperation and partnership arrangements, in the framework on an integrated approach which is consistent with Agenda 21, with a view of contributing to the achievement of sustainable development in affected areas.

The Convention commits governments through a bottom-up approach to involve populations and local communities in participating fully in the decisions on the design and the implementation of programmes to combat desertification and/or mitigate the effects of drought. This particular issue forms the basis of this concept paper. Parties to the Convention are required under Article 10 to develop National Action Programmes (NAPs) which commits them to take the necessary action to combat desertification and mitigate the effects of drought.

The paper which is divided into eight sections tries to focus on stakeholder participation, particularly affected populations in the National Action Programme (NAP) process. Part one and eight give brief introductions and conclusions respectively.

Part two deals with a brief on the nature of the problems of desertification and concludes that the problem is mostly associated with the rural poor. The same chapter tries to identify key stakeholders in the NAP process. It highlights the need to involve farmers, the government, non-governmental organizations (NGOs), academia, the business/private sector and the international community as some of the main stakeholders. The same chapter also tries to define some of the roles of these stakeholders.

The third Part of the paper analyzes the capacity of each stakeholder in their roles to realize the goals of the Convention. Each stakeholder is analyzed in terms of commitment and will to support the NAP process morally, politically and financially.

Part four tries to identify areas of conflict amongst stakeholders and suggests that stakeholders need to discuss such conflict and that dialogue and communication are an essential part of the process.

In Part five, the paper concentrates on strategies for awareness raising and institution building. It is important to raise awareness among target groups and all stakeholders. Countries will have various strategies but the most important include meetings, workshops/seminars, training and the use of print and electronic media. It is also important to review the capacity of stakeholders in order to be able to strengthen them.

Part six focuses on the strategies for motivating stakeholder groups in the drylands. Emphasis is placed on an understanding of the issues and also the benefits that will accrue from actions or activities undertaken by stakeholders.

Part seven briefly discusses stakeholder leadership and some aspects of cost sharing. It discusses leadership structures and the possible roles of leaders in the NAP process.

The paper concludes in Part eight and stresses the need to identify and specify the roles of stakeholders. The participation of the local population is very important. It calls for efforts to identify possible areas of conflict and discuss them. The need for strategies to

[1] A concept paper presented at the Afro-Asian Global NGO Forum on Drought and Desertification, 9-12 December, 1996, Hyderabad, India.

deal with awareness raising and institutional strengthening are important. Financing and commitment to the NAP process is equally important.

Introduction

The United Nations Convention on Desertification focuses on curbing the degradation of arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities (UNEP 1995).

The Convention was finalized in June 1994, after about a year of negotiations that involved more than one hundred governments. The Convention was opened for signature in Paris on 14 - 15 October 1994 and came into force on 26 December 1996.

The Convention provides for a framework for national, sub-regional and regional programmes to curb the degradation of drylands including semi-arid grasslands as well as deserts.

One fundamental issue the Convention addresses, the commitment governments must make to a "bottom-up approach" that involves the local populace, national authorities and the international community. This particular issue forms the basis of this concept paper. The paper will try to focus on stakeholders' participation, particularly affected populations in the NAP process. The following issues will be addressed:

- A stakeholder analysis of affected populations, governments, non-governmental organizations (NGOs) and other international organizations;
- Capacity assessment of each stakeholder and their contribution towards realization of the Convention goals;
- Identification of the areas of conflicts and some examples of resolutions of conflicts amongst stakeholders;
- Strategies for awareness raising;
- Strategies for motivating stakeholder groups in the drylands;
- Roles and responsibilities of each stakeholder group and identification of alternative options for livelihoods; and
- Leadership assessment of each stakeholder and cost sharing in designing and motivational activities.

Stakeholders Analysis

The problem of desertification

To be able to analyze the stakeholders, there is a need to understand the nature and extent of the problem of desertification. According to UNEP, over 250 million people around the world are under a direct threat of desertification and 750 million are indirectly affected (UNEP, 1995). The affected people are in some 100 countries and the desertification problem is affecting about 25 per cent of the Earth's land area.

The causes of desertification include: overgrazing, overcropping, poor irrigation practices and deforestation which are combined with climate changes or variations. Africa is reported to be the worst affected with about 66 per cent of the continent desert or dryland and much of the agricultural drylands are already degraded.

Desertification is, by its very nature, a problem associated with rural farmers or the poor who reside in the dry, sub-humid regions of the world. Most people live in the world's drylands and this is particularly so in many parts of Africa.

Article 10 of the Convention calls for governments of Parties to develop NAPs to combat desertification. NAPs will focus on identifying the factors that contribute to desertification and draw up the necessary steps that can be taken to combat desertification and mitigate the effects of drought. Within the NAPs, there is a need to identify the roles of various players such as governments, local communities and all land users. The need to "provide for effective participation at the local, national and regional levels of non-governmental organizations and local populations, both women and men, particularly resource users including farmers and pastoralists and therein representative organizations, in policy planning, decision-making and implementation and review of national action programmes" [CCD 10(2f)] cannot be over emphasized.

Stakeholders

The foregoing calls for stakeholders analysis in the NAP process in order to ensure that all stakeholders participate. Who are the stakeholders in the NAP process? Who owns the NAP? Who should own the NAP? These are very interesting questions which should guide the discussion. In a related discussion on stakeholder analysis for strategies for National Sustainable Development, Carew-Reid, et. al. (1994) identified the following groups as most likely to be affected by or to affect the strategies:

- governments
- academics
- resource user groups
- business
- local governments
- religious/cultural groups
- consumer groups
- unions
- NGOs
- communities and
- traditional community groups
- prominent persons

Within the NAP process most of these are also identified as stakeholders, however, within a broader grouping.

Mention has already been made of some of the people who reside in the affected areas. These affected communities include the following:

Farmers

Whether subsistence or peasant, pastoralist or commercial, these farmers are the first group of stakeholders who reside in the problem area and whose livelihood is dependent on the land, water and other resources found in the affected areas. The impact of desertification directly or indirectly affects the farming communities. In addressing some of the problems of desertification, the input of the farming community is vital. Their indigenous knowledge and experiences should be vital components of the NAPs. Ideally, the farmers should be the owners of the process and governments must facilitate this ownership.

Governments

Governments are major stakeholders in the development of NAPs. Governments have the responsibility for enhancing socio-economic development in the affected areas. They have to provide basic social, and infrastructural requirements as well as an enabling environment for economic development. Governments have a major role to play as the main coordinators of the NAP process and not as owners. Governments must endure that NAPs are nationally driven.

Non-Governmental Organizations

NGOs played an important role during the negotiations of the Convention and as such they remain important stakeholders in the NAP process. Within this category of stakeholders are, Community Based Organizations (CBOs) who together with NGOs have in many parts of the world complemented governments' developmental efforts especially in rural areas.

According to SADC, the involvement of NGOs in these programmes will ensure the decentralization of projects, taking into account the need for beneficiaries and the local environment. Where NGOs have a direct presence in the community they help promote popular participation. NGOs also ensure wider geographic coverage by their presence in remote and isolated areas where governments are marginally active (SADC, 1996).

Some donors have preferred to channel their developmental aid through NGOs and CBOs. Many of these stakeholders have an added advantage of ensuring and promoting local level participation which is an essential component of the NAP process.

Academics

If NAPs are to address the issues of training, science and technology, this group of stakeholders has a big role to play. Research institutions, technical colleges and universities, therefore, have an important input into the NAP process. The issues of developing alternative technologies, defining research priorities and training are better addressed through the involvement of academics.

Business/private sector

In many debates that focus on rural development the private and business sector are given a low profile. A lot of businesses in the private sector are dependent upon the natural resource base, especially in countries whose economies are so based. Desertification also indirectly or directly affects the private sector. This group should therefore be given the chance to contribute in the development of the NAP process. They could be a potential source of financing for some aspects of the NAP. The private sector could be the driving force for many economies in developing countries. Their activities could also be contributing towards the degradation of the environment. Therefore, they must participate in the NAP process.

While the above stakeholder groups could be classified as internal stakeholders, the following group of stakeholders can be classified as external.

Donors/international community

Some donors are very keen to participate right from the beginning in the planning of some development programmes. Apart from financing, they can also provide technical assistance. As such, it would be appropriate to involve donors or their international community in the NAP process.

Table 1 below shows a summary of stakeholders that need to be involved in the NAP process and their possible roles.

Capacity assessment of each stockholder for the realization of the goals of the convention

This part of the discussion will focus more on the capacity assessment of each stakeholder group, Table 1 has already highlighted some of the major roles of stakeholders.

Governments

With respect to governments as coordinators, their role is largely determined by factors such as: political will; finance and; the ability to coordinate and decentralize activities.

It must be understood that the problem of drought and desertification is not just a technical one. The environmental crisis is also complicated by social, economic and political factors, both internal and external, which governments have to endure. The problem is also influenced by the state of the world economy, commodity process, interest rates, energy imports and inappropriate and misplaced aid (United Nations Economic Commission for Africa, 1993).

Political will forms the basis of governments' commitment to resolving the issues of land degradation and desertification. Governments have got to show this by acceding and ratifying the Convention.

Within SADC for example, governments, apart from ratifying the Convention, were also called upon to undertake the following:

- Establishment of national desertification committees;
- Identify which ministries/ departments are responsible for the NAP process and national focal points;
- Establish an enabling environment for the NAP process i.e, legal/ institutional and administrative frameworks and mechanisms to facilitate the participation of NGOs and CBOs;
- Demonstrate the importance of desertification through for example, providing resources for

Table 1:
Summary of Stakeholders for the NAP Process

NAME OF STAKEHOLDER	DESCRIPTION	ROLE
Internal Stakeholders Farmers	Peasant/pastoralist commercial who reside and depend on the affected lands	* Very useful in problem identification and could also provide solutions to some of the problems * Have vast experience and indigenous technology *Owners of the process
Governments	Represented in the NAP process by selected sector ministries/departments	* Coordinator of all NAP activities through focal ministry/department * Assigns responsibilities to stakeholders * Ensures obligations under Convention are met * Mobilisation of masses
NGOs/CBOs	Locally based or internationally based NGOs involved in many environmental, developmental and other activities in many parts of the world	* Promote popular participation * Complement governments effort * Could provide funding for NAP activities
Academia	Include research institutions, technical colleges and universities	* Assist in carrying out research in various areas including technology development and alternative technology * Training
Business/private sector	Business and industry community	* Funding of some NAP activities
External Stakeholders Donors/international organizations	Include aid organizations and international community	* Source of funds * Technical assistance * Resource mobilization * Invest in affected areas

the implementation of NAPs and sensitizing ministries of development planning/finance about the Convention as a priority;

- Sensitizing cooperating partners about the Convention (SADC, 1996).

The above actions call for political will and strong commitment. Through such will, governments can be assessed of their capacity to realize the goals of the Convention.

Finance is a critical factor for the success of the NAP process. Governments must be able to source funds and finance the NAP process. Many governments in developing countries have and or are undertaking economic reforms, however, the impacts of such reforms have in some cases impacted negatively on rural communities and the environment. The introduction of market economies through Structural Adjustment Programmes (SAPs) has destroyed and undermined local management systems and has led to calls for cuts in resource allocation for activities that do not seem to generate income such as environmental protection (SADC 1996).

To date, the environmental effects of SAPs have not received much attention. Limited assessment and experience suggested that such effects can be positive or negative (UNEP, 1995). In some countries, particularly in Africa, the indications are that SAPs have had a negative impact on the environment. It is therefore important that economic policies be harmonised with social and environmental policies. Carew-Reid and others (1994) cited about 15 countries that had requested finance to initiate conservation strategies and yet resources for these countries were never found. Nigeria, Zimbabwe and Ethiopia even committed themselves to fund National Conservation Strategies (NCS) but this did not happen, which indicates

governments' incapacity to provide financial resources. The same authors also cite strategies in Asia, Africa and Latin America that have not been implemented due to lack of financial resources.

Under these circumstances the idea of establishing National Desertification Funds should be welcomed by many governments. This would certainly increase their capacity to finance the NAP process. Governments have the mandate to coordinate the design, planning and implementation of the NAP. They should ensure coordination among all stakeholders working on anti desertification programmes at national and local levels. Governments should not only coordinate but also be able to decentralize some of the decision-making and responsibilities to NGOs and local authorities. A decentralization process of decision-making will help to ensure popular participation particularly at the local level.

Governments' planning, administrative and political structures will largely determine whether it is possible for NAPs to be built up from local initiatives as advocated by the Convention.

The capacity for governments to deliver these responsibilities will largely depend upon the political commitment to address the issues of land degradation and desertification. This will certainly vary from country to country. If governments fail to address these issues, then their capacities will be questionable and their realization of the goals of the CCD Convention might not materialize.

Farmers

The capacity of farmers to play an effective role in the NAP process will largely be determined by the coordinator's ability to motivate the farmers or farming community to effectively play their role. Governments must provide an enabling environment for a participatory approach to take-off. Motivation and awareness building are key elements. Governments could share this responsibility with NGOs and CBOs and other stakeholders who might have the capacity to motivate and mobilize farmers. Farmers must be told of the benefits that will accrue to them as a result of the NAP.

For example, in Kenya and Zimbabwe, Natural Resources Management agreement, especially for wildlife involve local people in controlling access to wildlife and deriving benefits. If farmers are to have an interest in building terraces, planting trees, replenishing soil fertility or protecting wildlife, they need to have assured benefits from such activities. (UNEP, 1994). With such incentives and motivation farmers can contribute to the NAP process and their capacity to contribute is undoubted. Farmers have a wealth of experience, indigenous knowledge, and technology which can be of great value to the NAP process.

Robert Chambers captured it all "It is wiser to recognize that we, the experts, constitute a great part of the problem and that they, the poor among the poor, harbour a large part of the solution".

A bottom-up approach means that people at the local level have rights and responsibilities to plan and implement action (UNEP, 1994). If the farming community is not given the necessary support and motivation to contribute to the NAP process, then the implementation of NAP will be in jeopardy.

NGOs/CBOs

NGOs/CBOs must be given a positive role in the NAP process. Falloux and Talbot (1993) cite partial involvement of NGOs in a few country case studies on National Environmental Plans (NEAPs) especially in Rwanda, Ghana and Uganda. They asked "Why was there such a small NGO involvement in the NEAP?" The answer given was attributed to the governments' suspicion of the activities of NGOs and the failure of governments to realize the positive roles that NGOs/CBOs can play on the ground. In many countries worldwide, NGOs have provided the road to obtaining broad participation of the masses or public in environmental issues. This is one of the pre-requisite of the NAP process.

Falloux and Talbot (1993) carried out a comprehensive analysis of NGOs and described their roles as environmental "watchdogs", especially the powerful ones such as Environmental Defence Fund, Greenpeace, Friends of the Earth, Natural Resources Defence Council and the Sierra Club. Many NGOs focused on a single environmental issue, but have since broadened their outlook to deal with more issues. This is an indication of their capacity to deal with environmental issues. Most of the larger northern environmental NGOs now have well established programmes in the developing world, and have cooperatives arrangements with local or national African NGOs (Falloux and Tabolt, 1993).

NGOs can be effective vehicles of sustainable development throughout the country, by catalyzing participation, organizing and mobilizing groups, obtaining grassroots perspectives, raising awareness and providing long-term ideas, analysis and advocacy (Carew-Reid et. al., 1994).

The capacity of NGOs to deliver and effectively participate in the NAP process will also depend on adequate funding and capacity-building measures employed in the NAP process. Countries such as Papua New Guinea, gave equal emphasis to the building of non-governmental and governmental capacity in their Forestry and Conservation Action Plan.

Given the opportunity, NGOs can produce results faster than governments because they are more flexible than governments and at times require or make smaller financial demands than private firms for their services. Donors have also found it easier to work with NGOs than governments. Not only does a higher percentage of the funding find its way to the project on the ground, but there is usually far better local participation and extension/training.

Academia

Research experts and institutions should be accorded the opportunity to contribute to the NAP process. In many cases they are left out of the environmental debate. Yet it is this group of stakeholders that has the capacity and expertise to prepare background papers, provide published or unpublished statistics and conduct short-term studies. The need for information/data cannot be over emphasized during the NAP process.

Long-term research projects could also be undertaken as part of implementing the NAP.

Universities, research and policy institutions and independent professionals also have important contributions to make, particularly on issues that require independent analysis or subjects that are outside the expertise or mandates of particular agencies (Carew-Reid et. al., 1994).

The issues concerning research in alternative and renewable energy resources, especially solar, wind, hydro-power, biogass and appropriate low cost technologies would be best addressed with the participation of academics. According to the Economic Commission for Africa (1993) there is also a need to conduct socio-economic baseline studies in order to have a good understanding of the situation in the programme area, particularly in relation to, resource and land tenure issues, traditional land management practices and characteristics of production systems. All this and other information is useful for the NAP process. Governments and NGOs cannot handle it without the involvement of academics. However, as with any other groups/ institutions they need financial support to carry out research.

Business/private sector

This is another stakeholder group often ignored or left out of the environmental debate. However, business and industry including transnational corporations, play a crucial role and the social and economic development of many countries.

Business enterprises, large and small, formal and informal provide major trading, employment and livelihood opportunities in affected areas. The Economic Commission for Africa (1993) cites that business opportunities for women are contributing towards their professional development, strengthening their economic role and transforming social systems.

Waste from industry can negatively affect the environment and human health. Some business/industry leaders are already aware and are taking voluntary initiatives to improve the situation. The NAPs should also take advantage of industry initiatives and involve them in the process. This group of stakeholders is also dependent on natural resources which are being degraded and should, therefore, be willing to contribute towards halting degradation and desertification. They have the financial capacity to fund some activities of the NAP and can also promote alternative livelihoods for the rural communities. They can be called upon to use resources efficiently and to produce less wastes and emissions.

Donors/international organizations

The international community has been forthcoming in providing both financial and technical assistance to environmental programmes world-wide. Given the right environment, donors can contribute immensely towards the development of NAP processes. This, however, will depend on individual countries and bilateral relations with various donors. There is capacity within the donor community, however, tapping such capacity should be left to individual countries.

Conflict and resolutions between stakeholders

Partnership between the various stakeholders is based on the fact that they share a common vision. They want to halt land degradation, reduce poverty, advance human development and manage natural resources in a sustainable fashion. However, there are areas where conflict can arise. The paper will try to focus on a few such areas. These include conflicts over policies, fiscal resources and management, and conflicts over objectives and general perceptions of issues.

The relationship between governments and NGOs is complex and varies from country to country. NGOs have had a considerable impact on governments, either by offering models for new government programmes, proposing reforms to existing policies, or critiquing proposed government policies. In some cases, NGOs have focused opposition to government policies, even at the point of organizing demonstrations or using more confrontational tactics (World Resources, 1992).

In the area of policy formulation and reform, conflicts arise as a result of the non participation of all stakeholders. If NGOs, farmers, business and industry, academia and many other stakeholders are not consulted during policy formulation and reform, there is bound to be conflict when governments want to implement the policies.

Some government policies might inhibit or restrict the activities of other stake-holders. Tension might exist between the government's interest in controlling NGO activities and the NGOs interest in maintaining organizational autonomy. Governments may pass laws that require NGOs to register and regularly report their activities so that governments can manage or coordinate NGO activities. World Resources (1992) cite some governments, even those with a long history of working with NGOs, as being occasionally uneasy about NGOs. India, for example, proposed a code of conduct for NGO workers.

Within the NAP process policy, issues and policy decisions will have to be made for certain activities or projects. If all stakeholders are not consulted, especially those that are going to be affected by the policy, then there is bound to be conflict. "The definition of a policy problem depends on the pattern of particular policy stakeholders, that is individuals or groups which have a stake in policies because they affect and are affected by governmental decisions" (Dunn, 1981).

World Resources (1992), cite examples of policy decisions to construct large dams in Indonesia and India. Such decisions resulted in villagers protesting over the flooding of their land by large dam projects. In Kedung Ombo, Indonesia, the Government agreed to resettle 440 families in a nearby village, who resolved to move from their homes to a distant town with less fertile land.

Another common area of conflict relates to fiscal resources and management. In the past, governments in developing countries were seen as the sole means of providing solutions to development and environmental problems

and hence they have largely dictated how resources are spent. There is a growing recognition of the need to draw other stakeholders into determining how available resources can be utilized more effectively to address priority concerns (UNSO, 1995).

Priorities for funding have in most cases been determined by governments without the involvement of other stakeholders. In many developing countries priority for funding has been to those sectors of the economy that generate immediate or short terms benefits. The environment sector has therefore not been funded adequately as it does not generate immediate benefits. This has caused conflicts between governments and other stake-holders.

Financing of the NAP process is very critical. It is not an issue that can be left to government alone, especially when the process is supposed to be of a participatory nature. All stakeholders have to contribute towards financing the NAP. Stakeholders should be given the opportunity to decide on the disbursements of the funds according to agreed priorities.

Some NGOs might have the capacity to solicit for funds. World Resources (1992 - 1993) cites some governments as being nervous about the high level of foreign support for indigenous NGOs. To control foreign donations, some governments, for example, Indonesia, now requires Government approval for all foreign grants and requests can be turned down without explanation. This can cause conflicts between governments and NGOs.

Some donors might also give "tied" aid and this might not be acceptable to many governments and other stakeholders resulting in conflicts. Stakeholders must be given the opportunity to decide on what they want. In terms of general objectives and perception, there is the possibility that implementation may be hampered by conflicting objectives. Financiers or donors for example, might stress economic profitability as an objective or criteria against social and political objectives. The needs of the community are usually ignored in favour of objectives that do not relate to community needs. Stakeholders perceptions differ resulting in conflicts in designing and planning of projects and programmes. The participatory approach enables the views of all stakeholders to be heard.

A programme for land management focusing on the rehabilitation of vegetation cover in the Sahel for Burkina Faso, Niger and Senegal had a good participatory approach. It took into account many environmental, economic, institutional and social problems facing the people, particularly the clarification of rules of land tenure and on redefining the responsibilities and rights of local communities to manage their resources. In such a way, the programme takes care of some of the social, economic and environmental objectives of local communities.

There are many areas of conflict that can be identified and these will depend on the type of stakeholders and issues, projects and programmes under consideration. The NAP process should be able to take into consideration some of the differences that may arise and resolve them amicably.

Strategies for awareness raising and institutional building

Awareness raising

This is a critical issue which will determine the success of the NAP process. It is an obligation for the affected Parties to promote awareness and facilitate the participation of local populations, particularly women and youth, with the support of non-governmental organizations, in efforts to combat desertification and mitigate the effects of drought [CCD 5(d)].

The challenge is how to raise awareness and who should be the target group for such awareness raising. First and foremost awareness must be brought to the affected people as these are the people responsible for making the changes to their environment. The farming community should be made to appreciate the nature and extent of the problems before any solutions can be thought of.

When one has identified that target group for awareness raising, then it is possible to design a strategy to raise awareness.

Extension agents in the field of environment and development need to join hands to design appropriate strategies to reach affected communities. The following are among the most common strategies used in developing countries:

- Meetings/workshops and seminars with affected groups;
- Environmental training for media specialists to assist them in disseminating information;
- Mass communication - news media, primarily newspapers, radio and television;
- The use of local authorities such as community/traditional village and political leaders;
- Environmental education at all levels of training within the country's education system e.g. primary, secondary, technical and university.

There are many more strategies or approaches that can be used to create awareness. These will vary from country to country. The most important thing is to share the responsibility of bringing awareness to the people between all the stakeholders. Those stakeholders who are best in training youth, women, farmers etc. must be given the responsibilities of undertaking such training. NGOs are known to be very good at grassroots training and enlisting the participation of local people.

The methods of bringing about greater awareness will be determined by the costs involved and one cannot therefore prescribe any particular method or strategy.

Institution building

Once the stakeholders and institutions for the NAP process have been identified, it is important that a review of the capabilities of each stakeholder be undertaken. This will help in identifying the weaknesses of each stakeholder or institution. When this has been done, focus can be put on developing and strengthening institutions to deal with the NAP process and in building capacity within them to handle complex and inter-related issues.

Figure 1 below shows the possible elements of the NAP cycle adopted from

the Strategy Cycle in Carew-Reaid et. al. 1994.

There might also be a need to create new institutions to handle certain issues or there could be a need to amend the mandates of certain institutions or organizations depending on the circumstance.

Within all stages of the cycle there is a need to ensure that adequate capacity exists to undertake the mandates of each stage of the cycle and appropriate strategies by the responsible institution/ stakeholder.

Strategies for motivation

Earlier on in this discussion mention was made of the need to empower people during the NAP process. National Action Programmes are supposed to integrate local development programmes for affected areas, based on participatory mechanisms. The critical issue here is, how do we motivate the local populations and communities including women, farmers and pastoralists and empower them with the responsibility to manage their natural resources?

A key motivational strategy is to give the people the powers to control the use of their natural resources and to derive benefits from their utilization. Motivation of the affected people is important. If farmers are to have an interest in conserving their natural resources, they have to be assured of the benefits that will accrue from undertaking conservation activities. Will increased efforts to manage their resources or reversing environmental degradation bring higher yields and increased income?

In Gujarat India, the people from the Bhil Community were motivated to improve the environment and their livelihood. Through the Sadguru Water and Development Foundation the community embarked on conservation measures which included the construction of dams, watershed protection and social forestry programmes resulting in better health, incomes and education. As long as the people are assured of the benefits, the will to participate can also be assured and this is a good motivational strategy for the main stakeholder groups in the drylands.

NGOs and CBOs also need to be motivated in order to participate in the NAP process. One way of motivating them is by ensuring that they get the necessary financial support to participate and also to assure them of their roles and responsibilities. Many NGOs would like to strengthen their capacities and if assured of the opportunity to strengthen this capacity, they will be motivated enough to participate.

It should be noted, however, that many NGOs want to maintain their organizational autonomy and allowing such is a way of motivating NGOs.

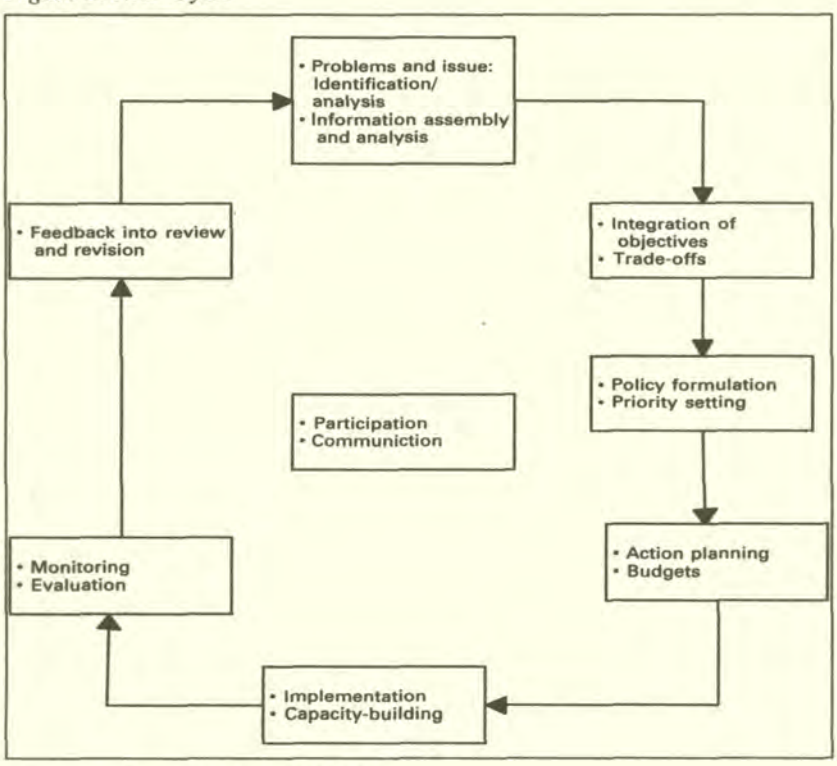
Academics on the other hand, can be motivated through the provision of adequate funding to enable them to undertake research and training and/or through capacity-building.

The business community and industry must be given the opportunity to invest in the affected dryland areas. They could be given economic incentives to invest and participate in the NAP process. Their participation might help in identifying alternative options for livelihoods.

The donor community may also be motivated if brought into the NAP process right at the beginning. This will enable them to identify with the process and will also give them the latitude to select activities they can fund.

Regular meetings with all stakeholders are necessary so that they can raise their concerns and constraints.

Figure 1: NAP Cycle



Source: Crew-Reid et.al. (1994)

Leadership assessment of stakeholders and cost sharing in the design and motivation phase

The stakeholders in the NAP process can only participate in the whole when there is effective leadership to guide them. Within each stakeholder group, there are defined leadership structures. It is the responsibility of each group to decide on the kind of leadership they want.

Within governments, there already exists a defined leadership structure and a mechanism of electing leaders. The critical issue, however, is the political commitment and approval of the NAP process. When governments take decisions to accede to the Convention and ratify, the political will is assured. This is one criteria we can use to assess the political will and leadership of

governments in accepting the Convention. Apart from that, governments are required, as coordinators of the process to designate focal points and participating ministries and departments. If the obligations of the governments are not carried out, then one is bound to question the leadership of the governments. Another important assessment is based on the size of the financial commitment made by governments. NAPs are supposed to be nationally driven programmes. Governments should bear the costs of the NAP process and should coordinate donor and other stakeholder inputs. Governments should be keen players in the design and motivation phase of the NAP process.

The farming or local communities have well-defined leadership structures. Most traditional leaders and local or village leaders are selected by the people themselves. The leaders are supposed to ensure the interests of their people are taken on board.

Once the communities have identified with the problems of land degradation and desertification and the resultant need for change for the better, then the leaders will have played their roles. The locals should participate in the planning and designing of the NAP process. Most of their contributions are in kind, either through the selling of their labour or any other activity carried out by locals that contributes to the process.

NGOs/CBOs also have defined leadership structures. It is through their leadership that contracts are made with governments, donors and other stakeholders. The performance of NGOs in the NAP process is reflective of the leadership of the NGOs concerned. They should participate and contribute in kind or financially to both the design and motivation phase.

Business and industry sectors have trade associations/organizations and the leaders of these organizations are responsible for ensuring their sector's input to the NAP process. They can also contribute financially to the design and motivational phase of the NAP, especially if there is productive dialogue between them, the governments and other stake-holders.

Likewise, academics have organizations or institutions with their own form of leadership which should be responsive to the outside world. Through dialogue with governments and other stakeholders they can participate in the NAP process and contribute like any other stakeholder.

Conclusion

The success of the NAP process will depend on a myriad of factors. However, a number of key issues can make the difference between success and failure, if inadequately addressed.

In the first place, the Convention calls upon NAPs to specify the respective roles of government, local communities and land users and the resources available and needed. It also calls for the provision of effective participation at the local, national and regional levels of non-governmental organizations and local populations including youth, women and men especially resource users, such as, farmers and pastoralists in all the cycle stages of the NAPs.

Given this scenario, it is imperative that a clear stakeholder analysis be undertaken before the process begins. It is equally important that the definition, of roles and responsibilities for each stakeholder be undertaken. Apart from that, there is a need to assess the capacity of each stakeholder and where possible, provision should be made to strengthen the capacity of some of the stakeholders.

In the NAP process, efforts must be made to identify possible areas of conflict and misunderstanding. These must be discussed with all the stakeholders and resolutions found.

A number of strategies have got to be designed or employed in order to address issues such as awareness raising, motivation and institution building. Communication, dialogue and training amongst stakeholders is also critical. Good leadership among all the stake-holders can only enhance the success of the NAPs and this should be taken advantage of.

Finally, the financing of NAPs is critical and governments as coordinators must ensure and commit themselves to funding the programmes. As nationally driven activities NAPs should be incorporated into the planning and developmental framework of countries. However, finance being a major constraint in developing countries, governments should solicit donor funding and also design cost-sharing approaches for all stakeholders.

References

1. Carew-Reid, J. et al 1994. "Strategies for National Sustainable Development" A Handbook for their Planning and Implementation.
2. Dunn, W. 1981. "Public Policy Analysis - An Introduction."
3. Falloux and Talbot, 1993. "Crisis and Opportunity: - Environment and Development in Africa".
4. SADC, 1996. Report on SADC Consultations and Workshops on a Sub-regional Action Programme on the Implementation of the Convention to Combat Desertification and its Urgent Action for Africa.
5. UNEP, 1995. Desertification Control Bulletin, No.26.
6. UNEP, 1994. Our Planet, Vol. 6 Number 5.
7. United Nations Economic and Social Council - Economic Commission for African Strategies for the Implementation of UNCED - Agenda 21".
8. United Nations Convention to Combat Desertification 1994.
9. UNSO, 1995. "National Desertification Funds" A Concept Paper on Possible Scope and Operational Modalities.
10. World Resources 1992 - 1993. "Towards Sustainable Development."

Acknowledgements

I would like to thank Ebbie Dengu, Director of the Intermediate Technology Development Group for nominating me to do this paper and for his review. Also my wife Charity, Itayi Guswana, Network Administrator Ministry of Environment and Tourism and Mrs Katsambe for assisting with the typing.

I also want to acknowledge United Nations Environment Programme (UNEP) particularly the Dryland Ecosystems and Desertification Control Programme Activity Centre for their support.

United Nations Convention to Combat Desertification: Networking among NGO-Basic Framework and Approaches[1]

E. Venkat Ramnayya

Director, Youth for Action
1-8-701/26/1
Padma Cology, Behind Shankarmatt
Hyderabad, India

Dr. S. Rajakutty

Director, Centre for Monitoring and Evaluation,
NIRD, Hyderabad, India

Abstract

Networking has long been recognized by research and business organizations as an important way of improving the effectiveness of their work. In recent years NGOs have been linking up with peer groups. Networks help in achieving social synergy and promoting wider dialogue, exchanging ideas, pooling efforts and working towards a common cause. Networks can be classified into different types based on their activities and membership. Networking is a slow but steady process. Deciding on leadership, roles and functions, clarification of objectives, membership composition, improving participation, accessing funds, training in networking management, establishing relationships at regional, international and global levels, evaluating networks etc., are crucial at the Network design stage. The Convention process for combating desertification emphasizes the importance of networks in the various Articles of the convention. The need for relevance of networking for CCD, suggests measures for enhancing cooperation through networks at various levels, the North-South relationship, obligations and objectives of proposed networks etc., which are discussed in this paper. A suggested framework for the CCD Network covers criteria for membership, the network coordinating and management committee, duties and responsibilities of various actors in the network, activities of the network and sources of funding. It is important to appreciate combating desertification cannot be done exclusively by any agency. Governments, international organizations, NGOs, Northern countries, people, research institutions etc., have to join hands with a view to pooling their resources and efforts.

Definition

A network is any group of individuals and/or organizations who, on a voluntary basis, exchange information or goods or implement joint activities and who organize themselves for that purpose in such a way that individual autonomy remains intact.

In addition to this definition, the meaning of networking assumes the willingness to share information and other resources in an environment of mutual trust and respect.

- Members take part on a voluntary basis; networking assumes the willingness to share information and other resources in an environment of mutual trust and respect.
- Members carry out joint activities that cannot easily be performed alone.
- Members' individual autonomy remains intact.
- Networks can have many different forms and use different procedures depending on the specific situation. There is therefore considerable diversity in networking experiences.
- The network's structure is often 'light' and not very formal.

Networking has long been recognized by research institutes, funding agencies business groups, etc., as an important way of improving the effectiveness of their work. NGOs have tended to value their independence very highly, but are presently linking up more and more with their peer groups.

Networking is about sharing; sharing may be one of the most demanding requirements in development work, yet it is the most essential common denominator developed by the poor in order to provide for each other and live under adverse conditions. This 'daring to share' 'is, therefore, neither easy nor automatic. It

[1] A concept paper presented at the Afro-Asian Global NGO Forum on Drought & Desertification, 9-12 December 1996, Hyderabad, India

requires a willingness to be open-minded, it requires having enough confidence in one's own work to expose it to others, and at the same time, the necessary humility to understand one's position as one among many.

Networking is more than simply working together more than the mere collaboration of individuals and institutions on the basis of common interests. Networks represent 'communities of ideas', a space for like-minded people to interact on the basis not only of common interests but of conflicting ones too, building mutual trust and learning to accommodate each other's needs. In focusing on 'mind' rather than 'matter', networking adds a fundamentally new quality to human co-operation. It enhances inclusive thinking, creativity and dialogue.

Networking is an activity in which we positively indulge in dialogue, are encouraged to exchange ideas and experiences, are urged to take the time to listen to each other and to work towards a new way of understanding old problems. On the face of it unproductive, this actually provides a space for reflection, for breaking down barriers and stimulating creativity. This can often lead to a considerable increase in the quality, if not also the quantity, of our work.

Typology

There are several types of network and several different criteria on which a

Considerations in defining the overall approach of an NGO network

Issue	Network	Advantages	Limitations
Orientation	Internal members	Allow action directly useful to areas	Difficult to develop approaches for larger
	External	Allows an integrated approach to managing the environment	Stronger dependence on government policy and risk of government control
	Combined	Allows good planning and integral focus; allows member's a wider perspective	Demands greater work effort and continuous evaluation
Subject of Networking	Specialized focus on a single technical subject	Allows rapid advances in tackling concrete problems	Risks separating research from its broader context
	General focus on low-external-input and sustainable agriculture	Allows an integral focus on the agricultural sector considerable	Requires more complex planning and implementation
	Integrated rural development focus	Allows projects and activities to be set in the context of an overall development strategy at local national and regional level	Requires longer periods, bigger structures and it is more difficult to mobilize people
Geographical coverage	Local	Allows site-specific adaptation of technology	Results are not necessarily relevant to large areas
	(Supra) National	Allows results with an impact for larger areas to be obtained; mobilizes more institutions and donors	Cohesion and participation difficult to maintain; requires more complex working methods
Membership	Limited to NGOs only	Stronger common interest of members	Does not allow direct interaction with farmers; can limit technological inputs
	Broader, involving farmers, research organizations, etc.	Cross-fertilization between research and development; greater access to new technology, knowledge	Potential for conflicts between research and development objectives

Jorge Manrique *et. al:* Andean unite: The Birth and growth of Andean Council of Ecological Management in linking with farmers. Networking for low external input and sustainable agriculture, Intermediate Technology Publication 1993.

typology can be based. Typology of networks according to membership and activities.

a. **By activities:** Information, materials exchange, training exchange, marketing, awareness raising, and policy dialogues.
b. **By membership:** farmers' organizations, non-governmental organizations, researchers and extensionists, and various categories.

The networks can also be classified based on geographical coverage or on subject matter focus (e.g. combating desertification). Advantages and disadvantages of different network types are presented overleaf.

Preconditions for networking

Not all experiences with networking have been positive. Many initiatives have failed. Recent experiences suggest that the following questions need to be considered before starting a network:

- Is there a common vision and a set of common goals among potential members?
- Do potential members face common problems and constraints?
- Are potential members aware of these problems and constraints and of their influence on their work?
- Do potential members, especially NGOs, have sufficient managerial and organizational skills?
- Are there relevant results/ experiences that can be shared?
- Do potential members have a good idea of what a network is and what it could mean to them?
- Can the coordination of a network be ensured, especially during its first phase of emergence?
- Can the necessary financial resources for network activities be mobilized from network members? If not, is there a chance of continuous donor funding?
- Is there enough commitment to overcome the problems of the network's establishment phase?

Development stages of a network

Given the great diversity of networks, it is obvious that there is no blueprint for their development. In reality, networks usually evolve slowly and follow a development path indicated by their own internal logic. The analysis of different experiences identifies some stages for most networks. These are:

Preparation: During this stage initiators identify a topic of common concern, formulate the idea of a network, and assess the interest of potential members. For any network it is important that this stage be based on the perceived needs of the potential members. In formal networks, however, the initiator plays a catalytic role which requires time, thought and financial resources. In research networks the host organizations generally provide the resources. In return they are able to influence the network in a direction they deem important. Finding financial resources is not easy during the preparation stage, because it is not yet certain whether the network will take off.

Establishment: During this stage the decision is taken to form a network, typically at a founding meeting of all potential members. The members also determine the mechanisms and structure for information exchange and collaboration. In some cases networks draw up formal rules and regulations, with a central committee and a well defined membership, and then organize funding. In other cases, establishment occurs informally, with the mechanisms and structure evolving according to need. Whether formally or informally, it is essential that members participate in planning activities at this stage. The relationship of the network with the initiators, the host institution and the donor has to be defined. The maintenance of a secretariat and of the equipment can be both costly and cost-ineffective unless real collaborative activities develop in the field. Formal networks can easily become yet another bureaucratic layer inhibiting rather than promoting the exchange of information and cooperation . As Gramalgo Rengifo of the Andean Project for Indigenous Technology (PRATEC) said 'Structuring life can freeze life'.

Operations: After establishment the network gradually becomes fully operational. It adapts according to environmental change and internal dynamics. The latter will be greatly influenced by personalities. A clear identification of the network's goals, structures and procedures and some training in network management will help guide the network through this stage.

Network activities

Experience shows that networks pursue a great variety of activities to achieve their objectives. However, some activities are common to almost all networks. Managing some kind of documentation or information centre or service is one of these. Here, information is pooled, processed and made accessible to all members. Information exchange is often promoted through a newsletter, varying from a two-page irregular bulletin to a regular, sometimes glossy, magazine. Further common instruments in networking are workshops and exchange visits.

Managing networks

Issues

Management issues in networking may relate, for example, to the way information is handled, the issue of leadership, the handling of differences between members, and the maintenance of members' commitment. All networks consider the rotation of leadership important to avoid monopolization. The internal processes of management should be evaluated periodically, preferably with the help of

outsiders. When there is a full-time secretariat, a separate steering committee should be appointed to make policy decisions and to avoid alienation of the secretariat from the members. The main role of the network's technical coordinators, often responsible for operations at regional level, is to ensure that members remain committed to the network. Managers and coordinators need to master the art of encouraging others, creating an atmosphere of mutual confidence and enthusiasm. Differences in technical approaches between members should be handled by accepting both points of view as legitimate rather than by forcing either or both of them to reach a uniform solution. Differences between members over network activities and procedures should be managed by delegating decisions to sub-committees and by encouraging regional activities. Managers must strike a balance between taking sufficient control to make the network more than the sum of its constituent parts, and allowing sufficient flexibility so that the individual members feel the relevance of activities for their own situation. Care should be taken that members who have limited access to electronic media and to fax machines are not excluded from the flow of information.

Facing the problems

Several problems in operating networks include: how best to structure and manage networks? How to acquire the necessary financial and human resources? How to monitor network performance and evaluate impact? Various ways of overcoming these problems were described by World Neighbors in its newsletter *World Neighbors in Action* (Fisher and Moeliono, 1992), from which the following are listed.

(a) Clarity of objectives:

The impact of any network can only be judged in relation to the network's goals, which need to be set early on. These goals will determine the types of people and organization that will join and the kinds of activity that the network will carry out. The objectives should be: (a) clear; (b) decided upon by as many of the participants as possible; and (c) reviewed regularly to see if the network is having the desired impact and to make sure its goals are still relevant.

(b) Domination

In networks involving institutions of different types, there will be different ideas about what the network should do. This can be positive, providing participants with an opportunity to challenge one another and so to stimulate each other's thinking until common ground is established and differences are worked out. However, if differences become too serious, competing groups may separate and the network will become paralyzed.

Sometimes a network is started by a few individuals or organizations who insist that those who join must share their views exactly. In other cases a small group may gradually begin to dominate decision-making and activities. If people bring a political agenda or personal or institutional conflicts to the network's meetings, small groups may begin to dominate while others are kept out of decision-making, being labelled as too academic, too far to the left, too far to the right and so on.

For the greatest impact, a network should include a variety of people and institutions that can relate to its objectives. Coalitions of many institutions and groups will stimulate debate and encourage collaboration, both of which are major reasons for networking. Steps need to be taken early to make sure most decisions and activities are made and carried out democratically.

(c) Tight central control

The domination of a network by a small group usually means that decisions will be made by a select few. This can make it difficult for the network to change, grow or accept new ideas.

While broad participation is important, there must nonetheless be a core of working members who take responsibility for organizing and managing the network. It is important that these people represent the larger group. To avoid giving too much power to the few, there must be a continuing process of leadership selection and review by the larger group. This process should be put in place early in the network's evolution.

These leaders must be able to think about the wider needs of the network and they must stay in touch with a wide variety of the network's members if they are to truly represent their thinking.

(d) Lack of participation

Because networks are voluntary, those who think the network's objectives are very important are likely to spend more time and energy on networking than those who do not. Larger agencies with better educated staff sometimes dominate participants from small rural NGOs. Participation is the heart of any network. A successful network sponsors events to encourage the development of shared objectives and provide opportunities for sharing between the entire range of participants from the small field-oriented programmes to the more vocal national or international organizations. The network must produce concrete results if it is to keep the smaller, more practically oriented field organizations interested in collaborating with academic or policy-level participants.

(e) Funding

Informal networks sometimes do not have funds specifically earmarked for network activities. This can limit the activities that can be organized and implemented. If participants must pay for activities themselves, organizations with fewer resources will of necessity be less active than those that can devote resources. On the other hand, when too much money is channelled through a network, competition for funds (or control over them) can lead to favouritism and so to conflicts.

Although effective networks are driven by enthusiasm, in the real world most networks need additional funds for their activities. A structure and process must be set up for planning and administering the network's finances. A donor agency that believes in the network's goals can be approached for support (but should not be allowed to control decision-making). Whether there is a donor or not, operating costs should be kept low and members should contribute at least some of their own

resources, for only then will they feel ownership of the network's results. Financial management must be supervised closely by a group of participants who are representative of the network as a whole.

(f) Competition:

As networks grow, they may come across other institutions working on the same or closely related issues. These other institutions, whether other networks, government agencies or NGOs, may feel threatened by competition from the new network. The competition may not only be for recognition, but also for opportunities, funds and participants.

Competition between groups can sometimes be reduced by forming links between them. Networks working on similar issues can arrange to specialize and to dovetail their activities enhancing cost-effectiveness. Collaboration is usually (though not always) more effective in getting the job done than is competition. Whether or not collaboration is immediately possible, contact with rival groups should be made and maintained so that each can learn what the other is doing, whether functions are being duplicated and how they might work together in the future.

(g) Time invested in networking

There is a risk that networking may drain staff time and other resources away from field work by becoming an objective of its own. This is especially true of ambitious or outward looking staff members concerned either to further their own careers or to promote the organization by achieving a high profile in the outside world.

These situations can be avoided by ensuring that networks are managed to serve the needs of members, and that field activities are properly monitored. For this purpose periodic sessions to evaluate progress and reflect on the network's general directions essential. These sessions should lead naturally into participatory planning, in which yearly work plans are made and the arrangements for evaluating activities are organized well in advance.

Training for network management

Additional skills may be required for managing networking among professionals. However, in many cases, formal management training will not be available. Many aspects of network management can be learned on the job or by studying the experiences of others in similar networks. Internships and field visits between networks can be organized for this purpose.

Formal training in network management may be considered an important priority for the future. Initiatives in this area could be taken by networks on the basis of the express needs of their constituent sub-networks.

Possible roles of support/ donor organizations during network formation:

- First, development support organizations can link up with emerging initiatives. In certain cases they can initiate things by approaching leading NGOs and inviting them to explore the possibility of forming a network. In this way they can play a catalytic role in breaking down existing patterns of non-collaboration.
- An ad-hoc committee or core group can then be formed, consisting of representatives of different NGOs. To allow the committee to do its preparatory work, the support organization can make some seed money available to cover travel and communication costs.
- The committee conducts a survey on the need for a network and of the available experience and expertise to be shared through it. On the basis of this survey, a register of members is made and the feasibility of the network becomes clear. A draft statement of intent on the network's purpose is formulated and presented to potential members. At this stage the support organization can link the members of the committee or core group to other emerging networks, for example by informing them of examples of registers from elsewhere in the world or by organizing exchange visits.
- A constituting meeting can then be organized, to which all potential members are invited. The meeting should agree on the intention, objectives, structure and activities of the network. The role of the support organization may be to fund and/or to host the meeting.
- Once the network has been formed, its finances need to be addressed. Networks should mobilize funds from their own resources to the extent possible. If these are insufficient, a funding proposal can be developed and presented to donor agencies. A support organization may, provide the necessary liaison at this point.
- Technical support to emerging networks should preferably be provided by networks with a similar background. Such a South-South support system would benefit from a register of similar existing networks. A supporting or donor agency may possess such a register or may make its development possible.
- Donor agencies should give priority to funding networks dedicated to combating desertification on a national or sub-national basis as a cost-effective way of promoting sustainable agriculture.

Funding support sources for networks

Networks can receive support from the FSSP, GTZ, GATE, ILCA, AGROTEC, the International Development Research Centre (IDRC), the Technical Centre for Agriculture and Rural Cooperation (CTA), the International Institute of Tropical Agriculture (IITA), Environment and Development in the Third World (ENDA), the Netherlands directorate General for International Cooperation (DGIS) and several national organizations

and projects within Africa and Asia besides national governments. These organizations work in the area of agricultural research and development.

A Challenge for funding agencies

In all cases, networks need funding at some stage of their existence. Seed money may be needed to establish a network and prepare the ground for it. Where network members are not supported by large institutions, money is needed to maintain the network. NGOs need to budget 'networking time' and funding agencies may need to be convinced of the need for what may at first seem an unproductive activity.

Expected Initial role of NGO network

(a) Publication of a newsletter concerning NGO action on combating desertification in the region;
(b) Strengthening national associations of NGOs, for example, in capacity-building and training;
(c) Preparing a booklet to contain:
   i. Sources of financial support;
   ii. Sources of technical support;
   iii. Sources of technology adoption.

The central issues

Several key issues which emerge from the experiences of NGO networking could be the guiding principle for the convention process of combating desertification.

(1) What triggers networking among NGOs

Networking efforts are triggered when the following three perceptions are widely shared by NGO leaders, staff and clients:

- A lack of access to the knowledge of others is hampering effective performance and causing specific problems.
- At a deeper level, there is a need to gain a more comprehensive and more subtle understanding of the complex problems NGOs are dealing with, and to create new ways of supporting grassroots development.
- The experiences of NGOs at the grassroots, and the interests of the poor on whose behalf they work, need to be voiced at national (or higher) level, in order to contribute to the formulation of more effective development policies.

The first perception leads to the wish to upgrade the performance of NGOs through collective action. It leads networks to emphasize the sharing of ideas and experiences, whether through meetings, communications technology or documents. The second impression leads to a wish to move upstream in terms of both analysis and activities. In so doing NGOs question the very relevance or efficacy of field operations themselves, i.e., 'reaching beyond the evident consequences of the problem at hand to address its source'. This process emphasizes shared diagnosis, reflection, the making of sense and meaning, and coordination at a strategic level. The main concern is to achieve a better paradigm of development a challenge seen as beyond the powers of any single agency action alone. This need emerges especially now that NGOs carry a major responsibility for developing more sustainable alternatives to conventional methods. Accordingly, the third impression leads to what may be termed an upshift among NGOs. In shifting the focus of their activities, NGOs give expression to the need to articulate alternatives and lobby for them through the media and in the corridors of power.

All three "U"s - upgrade, upstream and upshift- reflect, in one way or another, the desire to improve the quality of NGO work and the contribution NGOs make.

(2) What makes networks last?

An old Dutch proverb seems to fit network building nicely: 'a good beginning is half the job'. To succeed, networks must have firm foundations. These are best laid not by pushing things along as fast as possible but by taking one step at a time.

The following factors are critical to the successful establishment of formal networks:

- Planned activism, facilitating and supporting (never replacing or ignoring) the existing activities of members.
- The will and the opportunity to discuss, negotiate and agree on the mission of the network in a way that is transparent and agreeable to all or most of the prospective members.
- A cast of actors, including prime movers, network facilitators, prospective members and sponsors, willing and able to carry the networking process through its initial, ill-defined phase.
- Broad participation of prospective members in the design and implementation of initial activities.

(3) What activities characterize networks?

Networks span an enormous range of activities: from field trips to communication by satellite or electronic mail, from project planning to education and training, from editing a newsletter to organizing a conference, from lobbying ministers to admonishing a member for the late delivery of data, to name but a few. This is one of the reasons why it is hard to define networking as a phenomenon. Networks generally concentrate their efforts in four clusters of activities which are relevant to the proposed network for combating desertification.

(i) The provision of services refers mostly to information and training. In providing or commissioning services, the network seeks to make optimum use of the capabilities and facilities of its members, supplementing these with inputs from elsewhere when necessary. A needs assessment and/or a diagnosis of strengths and weaknesses among network members often serves as the starting point. Typically, the network secretariat is attached to the member organization considered most capable of running its most important services. The service function is supported by what might be called

the network communications infrastructure. Almost all networks have a newsletter, which acts as a major vehicle for the exchange of ideas and experiences.

(ii) Learning together embraces all the joint activities undertaken to raise members' level of understanding of the complexity of development problems. These may include mutual appraisals, exchange visits, workshops and other meetings, not as ends in themselves but as the starting point for reflection. Diagnosis and the making of an inventory of available technological and methodological options are often part of the process.

(iii) Advocacy refers to those activities performed or facilitated by the network on behalf of its members and clients that enable them to formulate proposals on contemporary development issues and voicing these to government and/or in the public media, conferences on controversial issues, contribute articles to scientific journals, or distribute relevant publications to key decision makers. Coalition building with relevant parties from outside the network, or with other networks, is often on the agenda as well. The advocacy function of NGO networks however is not currently as widespread or as transparent as their learning and service functions.

(iv) The management function consists of facilitating the networking process. This includes maintaining or improving its communication infrastructure, overseeing its operating procedures, monitoring its resources, activities and outputs, and linking with other organizations and networks. Networking secretariats are kept lean, delegating as many tasks as possible to member organizations. A directory of members and their organizations is often among the first fruits of a new network. It is generally motivated by the wish to facilitate networking without having to go through the secretariat. The network facilitators' mandate usually stems from a meeting of prospective members who decide to initiate a more formal networking process but it is generally a mandate to advise and support, not to organize and command. Most networks decide not to engage in the management of funds for members, however expedient this may seem at a certain moment.

A secretariat for the networks

It seems important to define clearly the composition, responsibilities and prerogatives of the network board, secretariat and, if applicable, implementing bodies. The degree to which the secretariat or hub of the network should engage in implementing activities itself is an issue that frequently arises. Whether formal rules should replace the largely unwritten rules that govern operations during the early stages also tends to be an issue. Although it is difficult to generalize, experience suggests that a degree of formality is desirable in larger, older networks, and that the secretariat should have a mandate to take decisions on membership, on the provision of advisory and other services, and on monitoring and evaluation issues, particularly where these are sensitive.

Fund raising for the network

Even if network activities are mostly delegated to members, they still require time and money. The moment networks become more permanent, therefore, the issue of fund raising comes up. During the early days, prime movers free up the energy and other resources required for networking from somewhere else, often from within their own programmes. Donors enter the scene only when the contours of the new network have already been delineated. This means that during the early stages exchange and communication is often limited to those who are able to provide the necessary facilities and funds themselves. This limits the participatory process precisely at the stage when broad participation appears most desirable, even mandatory. Sponsorship during the early stages can thus make an important contribution to ensuring broad initial participation.

Evaluating network performance

The value added by networking

What is the value added to development through networking? What impact does it have on NGO performance? And how can we measure it? Does networking have a direct impact of its own, or only an indirect one, through improving the impact of network members? We are as yet far from being able to answer such questions convincingly. The study of networks among NGOs, and their effects on the work they do, has only just begun. Hence, opinions vary widely between supporters and critics of networking.

Networking efforts can be evaluated against their contribution to the three U's, (upgrading, upstreaming, upshifting) as follows:

- They may help upgrade the quality of the activities, outputs and impact of member NGOs, by providing mutual support and services on the basis of a joint assessment of needs.
- They may facilitate a collective learning process among their members, helping to move the analysis of development problems upstream.
- Networks may contribute to an upshift of NGO activity, redirecting it towards national and international audiences.

A Framework for self-evaluation

As a first attempt, we may formulate a framework for evaluating network performance and impact, as summarized in Table 1. The table presents possible indicators for assessing network achievements for each of the four criteria outlined above.

A Possible Approach for Evaluating NGO Network Performance*

A. Main Objective B. Main Function	Network performance Indicators	Network Impact Indicators
A. Upgrade NGO performance	Quality resource inventory and needs assessment	Total Change in efficacy and efficiency of members
B. Services	Closeness-of-fit of services with mission Quality of services Intensify of use of services by members Allocation of costs	
A. Move NGO activities Upstream	Quality of joint learning processes Coverage/distribution of learning experiences	Total change in efficacy and effectiveness of members
B. Learning together	Definition and transparency of technical and methodological standards Clarity of analysis of development issues	
B. Learning together	Definition and transparency of technical and methodological standards Clarity of analysis of development issues	
A. Create upshift in NGO activities	Frequency and relevance of external contracts	Total increase in members' impact on development
Advocacy	Articulation of alternative development issues Increase in members participation in public development debate	
A. Network development and maintenance	Roles of different network actors in developing the network's mission and organizational plan	Effectiveness of network operations
B. Network management	Relevance of participating NGOs to network's purpose Design and operation of network communications infrastructure Design and operation of financial and administrative structures Quality of decision-making procedures Efficacy and efficiency of secretariat or facilitation unit(s)	

*Paul G. H. Engel: Daring to share: Networking among NGOs, in Linking with Farmers-Networking for Low External-Input and Sustainable Agriculture: Intermediate Technology Publication 1993.

Basic framework for networking under the convention process

Relevance of Networking for the Convention Process

Land degradation and desertification affects about one sixth of the world's population. The most obvious impact of desertification, in addition to widespread poverty, is the degradation of 3.3 billion hectares of the total area of rangeland, the decline in soil fertility and soil structure and the degradation of irrigated cropland.

In response to the above situation the Convention to Combat Desertification (CCD) was formally adopted on 17th June 1994 and opened for signature in Paris on 14 and 15 October 1994. The core of the Convention is the development of national and subregional/regional action programmes to combat desertification. These action programmes are to be developed by national governments in close cooperation with donors, local populations and voluntary organizations.

Cooperation among NGOs

Various steps leading to the exchange of experience and dissemination of ideas among NGOs, the reasons why such interaction and cooperation are necessary, an agenda for closer cooperation between NGOs within a country and between countries in the region and various probable components for undertaking such a programme are as follows:

(a) Having a common framework for undertaking various programmes for combating desertification. NGOs have an urgent need for an exchange of experiences in the region. As of now the scope for dissemination of such ideas within and beyond a particular country is very limited;

(b) Many new paradigms are being tried, but their success and failure are not known among the NGOs; there is a need for developing a regional forum, which could serve as a conduit for examining whether and how there could be scope for adapting paradigms to fit a particular setting;

(c) Many NGOs had very useful and effective training programmes, but the methodologies and content of such programmes were not being shared among the various regional training centres. Joint programmes/projects for promoting people-to-people exchange need to be developed;

(d) The need for NGOs to link up regionally to create strong bargaining power especially vis-a-vis several controversial issues is felt very strongly;

(e) Most importantly NGOs in the Asia-Africa region are small and are operating in a limited area. On the other hand the problem of desertification is huge and cannot be tackled by NGOs alone. Cooperation among governments, research institutions, international agencies and donors is essential. This is feasible only through networking in the following manner;

(f) NGO and government organization interaction at the grassroots and national levels of leadership, structures and activities of successful NGOs;

(i) NGO self-reliance on indigenous resources as an alternative to external support.

(ii) A regular tripartite (NGOs, government organizations and donors) workshop to discuss a policy framework for NGO development;

(iii) Continuous dialogue between Government organizations-NGOs.

The needs will include advocacy in non affected countries. Education of the public in both affected and non-affected countries, awareness raising among dryland populations, resource mobilization, development and implementation of alternative dryland approaches, policy formulation, mobilization of community and organization of people etc. Providing a strong voice in the first Conference of the Parties (COP) which is scheduled to take place during the second half of 1997 is of immediate importance and hence an efficient and global network among NGOs working with dryland populations is seen as a crucial element for achieving the Convention goals. This Global NGO Conference at Hyderabad will facilitate exchange and develop further ideas.

Assessment of capacity building measures/ partnership arrangements

- The network when operational, has to build its own management capacity. On the one hand, it has to play a greater role in building capacities through community organization and implementation of programmes with the help of an appropriate blend of indigenous knowledge and modern science and technology. On the other hand, partnership arrangements have to be established with the following stakeholders;
- Conference of the Parties for the CCD.
- Governments
- Intergovernmental organizations
- United Nations agencies
- Bilateral donor agencies
- Research and academic institutions
- Private/business sector
- Grassroots organizations and others.

In addition to the above, since the network is based on certain issues e.g., RIOD (India)-land degradation, drought and desertification, it is necessary to identify and clarify major groups of NGOs involved in dryland development for establishing partnership arrangements as well as identification of various areas for capacity building of all NGOs.

The capacity-building measures can be classified as in country, sub-regional and regional basis a 12-month strategy can be evolved to begin with. The capacity- building measures may include training, experience sharing workshops and field visits to the sites where governments as well as NGOs are implementing dryland development programmes.

Suggested measures of enhancing cooperation through networking between southern and northern NGOs.

(a) North-South relationships

Many NGOs and research organizations of the South have been established by and/or receive considerable funding from donor agencies based in the North. (Some of these NGOs have a specific ideological or religious mandate.) Both project-based and core funding may be involved. This means that their work plans and budgets have to be approved by people in the North. Such dependence may introduce a northern bias in the choice of priorities and criteria for planning and evaluation. It may, however, be recognized that Northern NGOs are relatively bigger and stronger. They have built up capacity (a) to influence policies at global level; (b) garner resources at a larger scale; and (c) to provide access to various technological options. In view of their wider and longer experience, the support from northern NGOs in supporting NGOs and networks in the South is more crucial and important.

(b) Some specific areas may include:

- Preparation and implementation of efficient media policy.
- involvement of northern private sector.
- Building of the public perception in northern countries.
- Mobilize resources in the northern countries.
- Exchange of information on scientific inputs with southern NGOs.
- Working relationship with southern NGOs for the implementation of the Convention objectives.
- Support mechanisms for such, i.e. trainings etc., email conferencing and photo exhibitions.

Policy analysis

The CCD came into force on 26 December 1996. It is time for NGOs and networks like RIOD to be involved in policy dialogues. The suggested measures are:

- Policy dialogue workshops.
- Lobbying techniques.
- Support workshops on the Global Mechanism, Permanent Secretariat, Science and Technology panels etc., and preparation of relevant policy papers.
- An exclusive policy paper on the involvement of the private sector in the implementation of the Convention.
- Advocacy and lobbying for establishment of national committees bringing together all the stakeholders in the committee for implementation.

Obligation and objectives of the proposed network for combating desertification

The following extracts are drawn from the various Articles of the United Nations Convention to Combat Desertification. The relevant portions are excerpted here.

(a) The obligation and objectives of the network emanates from Article 4 under part II General Provisions of the CCD. The proposed network will work to:

- Strengthen sub-regional, regional and international cooperation.
- Cooperate within relevant intergovernmental organizations.
- Determine institutional mechanisms, if appropriate, keeping in mind the need to avoid duplication.
- Promote the use of existing bilateral and multilateral financial mechanisms and arrangements that mobilize and channel substantial financial resources to affected developing country parties in combating desertification and mitigating the effects of drought.

(b) Obligations of affected country parties.

The following provisions in Article 5, Obligations of Affected Country Parties are relevant to the network which is been proposed. These are:

- Promote awareness and facilitate the participation of local populations, particularly women and youth, with the support of non-governmental organizations, in efforts to combat desertification and mitigate the effects of drought.
- Provide an enabling environment by strengthening, as appropriate relevant existing legislation and, where they do not exist, enacting new laws and establishing long-term policies and action programmes.

The importance and need for joint efforts arises from three provisions of the Article 10 of NAPs which includes:

- Enhance national climatological, meteorological and hydrological capabilities and the means to provide for drought early warning.
- Promote policies and strengthen institutional frameworks which develop cooperation and co-ordination, in a spirit of partnership between the donor community, governments at all levels, local populations and community groups, and facilitate access by local populations to appropriate information and technology.
- Provide for effective participation at the local, national and regional levels of non-governmental organizations and local populations, both women and men, particularly resource users including farmers and pastoralists and their respective organizations, in policy planning, decision-making, and implementation and review of national action programmes.

(c) Article 13 on Support for the elaboration and implementation of action programmes also indicates the need for a network as stated in item I B of Article 13.

- Elaboration and use of cooperation mechanisms which better enable support at the local level, including

action through non-governmental organizations, in order to promote the replicability of successful pilot programme activities where relevant.

(d) The other areas of information collection and exchange of information are also in article 17 under Research and Development which is as follows:

- Facilitate and strengthen the functioning of the global network of institutions and facilities for the collection, analysis and exchange of information, as well as for systematic observation at all levels, which shall, inter alia:

  (i) Aim to use compatible standards and systems.

  (ii) Encompass relevant data and stations, including in remote areas.

  (iii) Use and disseminate modern technology for data collection, transmission and assessment on land degradation, and

  (iv) Link national, sub-regional and regional data and information centres more closely with global information sources.

Promote the conduct of joint research programmes between national sub-regional, regional and international research organizations, in both the public and private sectors, for the development of improved, affordable and accessible technologies for sustainable development through effective participation of local populations and communities.

Duties and responsibilities

a) Secretariat

Location: There are two alternatives:

(a) To open a separate Secretariat;

(b) To seek a volunteer from one of the members to function as Secretariat.

This is applicable at global, regional, sub-regional and national level.

Size: It is preferable to keep the Secretariat lean to begin with . Perhaps one Secretary-General, a few supporting staff, not exceeding five members.

Network Co-ordination and Management Committees at Different levels - Suggested Composition

Types of Representative	Global	Regional	Sub-regional	National
I. Global Network	1	1	1	1
II. National networks	4	2	3	5
III. Sub-regional level	1 each (SR)	1 member from each (SR)	1 member from	optional
IV. Regional	1	1 region	1 from concerned	optional
V. Donor	1 from major donor	1	1	optional
VI. Convention	1	1	1	1
VII. Research Organizations	2	2	2	4
VIII. National governments	2	4	4	2
IX. Private sector	2	2	2	2

Duties:

(1) Maintain list of regional, sub-regional and national members.

(2) Correspond and liaise with regional, sub-regional and national levels.

(3) Information clearing-house at global level.

(i) Publication of newsletter;

(ii) Compilation of NAPs;

(iii) Compilation of APs at regional and sub-regional level;

(iv) Organizing global co-ordination committee meetings;

(v) Organizing workshop/ seminars etc.;

(vi) Raising funds for network;

(vii) Liaison with research organizations, northern NGOs international organizations.

(b) Coordination Committees: at global/regional/sub-regional and national levels

(i) Review the functioning of the network and suggest measures to strengthen the activities of the network at different levels;

(ii) Conflict resolution among network members;

(iii) Mobilization of public opinion, governmental/private sector support and local support;

(iv) Assessing the training needs of members particularly NGOs and assisting in formulating and implementing training plans;

(v) Identifying areas of concern/themes for workshops/ seminars at various levels;

(vi) Identifying research/ scientific institutions for collaborations and association.

(c) Members

(i) Take part in the Convention activities on a voluntary basis;

(ii) Contribute to the network budget and extend support to programmes;

(iii) Carry out joint programmes with network members;

(iv) Work towards strengthening network;

(v) To highlight problems at the local level and encourage dialogue to find solutions;

(vi) Foster spirit of sharing, working together to achieve social synergy.

(d) Donors

(i) To help promote and strengthen networks;

(ii) To help promote cooperation among South - South and South - North networks, NGOs and institution;

(iii) To provide fund for programmes, exchange visits, seminar/workshops, training of NGOs and the carrying out of surveys/studies;

(iv) To support networks at regional, sub-regional and national levels;

(v) To actively participate in coordination committees at different levels and assist in fostering and strengthening networks.

(e) National governments

(i) To consult and involve NGOs through continuous dialogue, in national programmes combating desertification;

(ii) To encourage research institutions/organizations in public sector to participate in and support the programmes of networks;

(iii) To involve NGOs in government programmes at grassroot levels and national levels of leadership, structures and activities;

(iv) To participate regularly in a tripatriate consultation workshop of NGOs, governments and donors and create a national level steering committee for the Convention.

Membership

(a) Possible members of network for combating desertification

NGOs: Local (grassroots), state, national, regional level.

Government: Local governments, states, national government, quasi government organization (boards, corporations, agency)

Institutions: Research institutions, training institutions, universities corporate sector

International: United Nations organizations, international NGOs (e.g. Oxfam, Action Aid) other organizations (e.g. SIDA, DANIDA) and governments, EEC.

Individuals: Eminent scientists/ environmentalists/activists/academics.

(b) Criteria for membership

(i) All NGOs who have commitment and interest in the Articles of the Convention to Combat Desertification;

(ii) NGOs who are willing to abide by the guiding principles and programmes of the network;

(iii) NGOs who work on issues of concern related to the Convention at a grassroots level through people participation and community mobilisation;

(iv) NGOs who are willing to contribute resources to the success of the intention of the network.

Funding

(a) Contributions by members;
(b) Seed money from donors;
(c) Contribution by national governments;
(d) Donations from private sector

Conclusion

It is important to recognize that combating desertification is a massive task to be taken up by any individual organization or agency. It is geographically widespread around the globe and varies in magnitude, intensity and form. Technologies and methods from across the world need to be exchanged. The efforts of various agencies, groups and people have to be pooled together with a common minimum agenda to tackle the problem. Such a process will necessarily involve establishing fruitful relationships among the various players in the field. In this context, networking at national, regional, international and global levels is an urgent imperative. The suggested framework in this paper is only a beginning. If the conference could deliberate the various issues and came out with some concrete proposals and agreed framework, we would have accomplished an important milestone.

Integrated Whole Farm/Whole Landscape Planning[1]

Compiled by:

Ken F. Johnson

c/oR.G. Watkins
Haynesdale Rd
Frankland 6396
Western Australia

Abstract:

Ron and Suzanne Watkins of Frankland, Western Australia, have developed a new approach to land management in order to better manage their 552ha farm. Calling it 'Integrated Whole Farm/ Whole Landscape Planning', their approach tackles land use and land degradation issues by working closely with the shape of the land and by better management of their water supplies, on a whole farm basis. Beginning at the top of the catchment a series of inter-connected surface drains, flanked on one side with rows of productive tree crops, capture water and transport it into dams. This gives greater control and storage of water, reduced wind and water erosion, and lowers groundwater levels. The tree belts moderate the macro and micro climate, creating a better growing environment for crops and improved grazing for livestock. Flora and fauna biodiversity is also enhanced and is enabling the substitution of chemical insecticides with the biological control of pests. This integrated approach to farm management has enabled the Watkins' to intensify and diversify their farming enterprise and has increased the carrying capacity and production of the farm.

Background

Introduction

Ron and Suzanne Watkins live at 'Payneham', a 552 hectare (1,380 acre) property located in the small farming community of Frankland, in the south-west region of Western Australia (figure 1). Production at 'Payneham' is based on the traditional enterprises of the area, with 2,000 sheep, 50 head of cattle and cropping on 15 per cent to 20 per cent of the farm. Oats, lupins and canola are the predominate crops. Irrigation is currently restricted to three hectares of flood irrigated lucerne. This will soon be expanded to include olives.

Climate

The climate of south-west Western Australia is Mediterranean with hot, dry summers and cool, wet winters. Summer temperatures range from 13°C to 38°C and in winter, from 5°C to 14°C. The average annual rainfall at 'Payneham' is 580mm, spread over a six month period from mid-April to mid-October. However, on a year to year basis the distribution of rainfall is highly variable, the rainy season beginning from early-March to late-May and finishing between September and November. Very little rain falls during the dry season. As a consequence, there is a need for farming systems that minimize the higher risk associated with farming in this climate.

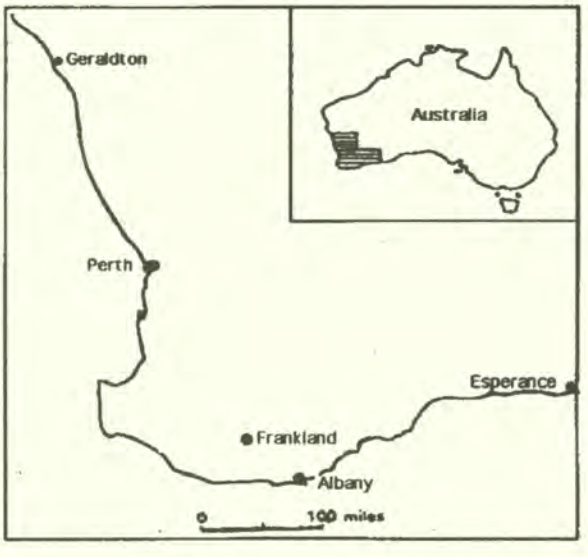


Figure 1: Locality of Frankland within south-west Western Australia.

[1] Winner of UNEP's Saving the Drylands Award 1995

Vegetation

Prior to settlement the Frankland region was primarily covered in medium forest dominated by an upper-storey of Jarrah (*Eucalyptus marginata*), Wandoo (*Eucalyptus wandoo)* and Marri (*Eucalyptus calophylla*). The under-storey comprised a diverse variety of grasses, shrubs and wildflower species, creating a botanically rich environment. Many of these species, along with the indigenous bird and marsupial fauna that inhabited them, have become rare, endangered or in some cases extinct since the onset of clearing for agriculture and the spread of introduced animals, in particular the rabbit and fox.

Clearing of the vegetation began in the early 1900s but progressed slowly until the 1950s, when the introduction of bulldozers allowed the work to proceed at a much greater rate. Only in recent years has clearing been more strictly regulated, requiring government approval for areas greater than one hectare. Much of what remains, however is fragmented and degraded, some areas having less than five per cent of their original vegetation still present. This ongoing loss of biodiversity is of enormous concern to the general community and is increasingly being seen as a priority issue for those on the land.

Soil

The two main soil groups occurring on the property are sandy yellow podsolic and gravelly lateritic podsolic duplex soils, the latter being more common. These soils are mildly acidic (pH 5.5-6.5) in the A horizon, with naturally low levels of phosphorus, potassium, sulphur and trace elements. The yellow podsolic has a loamy sand A horizon of 0.5-1.5m depth with a shallow, weakly structured topsoil of 5-10cm, and a sandy clay B horizon. The A horizon of the lateritic podsolic is similar, but much more gravelly, and its B horizon is a medium clay.

The B horizon of both soils is of low hydraulic conductivity and acts as a physical barrier to the vertical downflow of soil water. This commonly results in the development of a parched aquifer during winter that leads to extensive waterlogging, persisting until early spring. In some years as much as two thirds of the district may be waterlogged.

Land/soil degradation

Along with waterlogging, secondary salinisation has become a significant and widespread issue in this part of Australia. Significant deposits of salt, thought to have been carried from the ocean by prevailing winds and deposited over thousands of years, occur naturally in the sub-soils of south-west Western Australia, at levels as high as 10,000 t/ha. With the clearing of deep-rooted perennial native vegetation there has been an increase in groundwater recharge. As the water table has risen many of these salts have been brought to the surface, causing salinisation of large areas within the lower landscape. Salinity also appears as salt scalds higher in the landscape where hardpans, dolerite or quartz dykes, shallow bedrock or changes in slope concentrate groundwater and force it up to the surface.

Other forms of land/soil degradation have also appeared since the introduction of agriculture on these soils. These include wind and water erosion, sodicity, soil structure decline and loss of soil organic matter. The poor natural fertility of the soil has led to a history of heavy fertilizer application and consequently surface and sub-surface acidification are also becoming common. All of these problems have occurred to a greater or lesser extent on Mr. Watkins' property and are being managed within the framework of his holistic approach to farm management.

History

Originally settled by his grandfather in 1908, Mr. Watkins took over the family farm in 1973. Towards the late 1970's he became aware that water supplies to the house were becoming increasingly saline, while at the same time there were salt scalds appearing on some of the earliest cleared paddocks of his farm. This made him realize that the traditional farming practices were not in balance with the environment, and became the initial driving force behind his search for alternative approaches to land management.

His first discovery was to realize that salinization was caused by excess water in the landscape rather than excess salt, to which he responded by leaving belts of trees running along the contour during final clearing of the property. Based on Department of Agriculture hydrological figures, Mr. Watkins calculated that 337,500m^3 of water was running off his property annually. This confirmed that water was not, as many had thought, in short supply but that the traditional farming system could not utilize the water. The excess water was not only being wasted but was contributing to much of the degradation on his farm. Mr. Watkins then began looking at ways of better managing his water supply.

Initial contact with the Department of Agriculture proved unsatisfactory, causing Mr. Watkins to turn to the work of P.A Yeomans, developer of the Keyline Plan, and Harry Whittington of WISALTS, a Western Australian organization seeking to manage the problem of secondary salinisation. Yeomans' emphasis on working with the shape of the land and his method of harvesting water for storage and gravity-fed flood irrigation was to form the basis for much of Mr Watkins' own work. From WISALTS, he learnt about the fresh water aquifer on the B horizon that is common to this region, and how to survey drains to capture it. Combining elements from both Keyline and WISALTS, a 30,000m^3 'contour' dam connected to drains was constructed in 1982.

The following year, using six metre deep pits dug on his property and by careful observation, he identified four pathways of water through the soil. These were;

(1) Surface runoff;
(2) A perched, freshwater aquifer (top of the B Horizon);
(3) A perched saline aquifer, associated with silicified hardpans, and;
(4) A deep saline aquifer.

Having identified these pathways Mr. Watkins determined that any system trying to control water must deal with all four pathways. Surface drains or tree belts in isolation could not adequately deal with all sources of water.

Furthermore, after observing the movement of water, wind and soil in his catchment over a number of years, sometimes at night, he decided that if other forms of land degradation were also to be managed then a whole-farm approach was necessary. Thus in 1982, having combined the strengths of what others were doing with his own observations and analysis of the problems, he designed and installed the first interceptor drains of his new whole-farm plan.

The system

Approach

"Farming within the environment" is how Mr. Watkins describes the overall philosophy of his innovation. Naming it 'Integrated Whole Farm/ Whole Landscape Planning', the primary aim is to stabilize the environment so as to reduce land degradation and increase productivity. In order to effectively achieve this, Mr. Watkins has had to dispense with the common single issue approach to farm planning and develop an integrated, holistic and multi-dimensional approach.

A consequence of this has been the integration of land management and land-use management. The land management aspect of the system is established first, in the creation of what Mr. Watkins calls the 'macro protection' system. This encompasses the arrangement of drains and treebelts, dams, waterways and fenced vegetation, designed to provide protection against extreme or otherwise damaging climatic events. Having established these, the land-use management aspects, such as biological pest control, soil development and alternative farming enterprises, can proceed.

Premises

Mr. Watkins' approach is based on two fundamental premises. The first is that the most immovable object in any landscape is the shape of the landscape itself. Therefore all planning must be founded on and make greatest use of the natural shape of the landscape. Current farming systems based on straight lines are not designed to do this, which has led to what Mr.. Watkins calls "straight farming in a round world". Mr. Watkins' plans differ in that they incorporate land and land-use management into each individual landscape using significant landscape features, such as ridge and valley formations, saddles, rocky outcrops, changes in slope and large dam sites.

The pattern of the landscape is used to locate the best dam sites, which are then linked by drains positioned to intersect saddles and changes of slope. The paddocks, developed between the drains, are linked by a laneway system which facilitates quicker access to each paddock and movement of stock by one person. Less productive land, such as rocky outcrops and land affected by salinity, is fenced and replanted with trees, while remnant vegetation is also fenced to exclude stock. The final plan is unique to each property as the landscape dictates and integrates all the physical features of that environment.

The second fundamental premise is that water is the most precious resource. Agriculture cannot survive without an adequate and regular supply of water and yet previous farming systems were never developed to suit the Australian climate. As a consequence farmers were often forced to cart in stock water during summer, while excess water during winter was allowed to run off the property, contributing to many of the land degradation problems. Mr. Watkins' plan is designed to change this by creating the infrastructure to safely collect and store a greater percentage of annual rainfall, in order to allow better use of this valuable resource.

The drains

Beginning at the top of the catchment or hill, surface drains flanked on their lower side with rows of trees are constructed, falling at a gradient of 1:400, relative to the contour of the B horizon rather than the soil surface, and feeding into storage dams (photo 1). The drains are dug to a depth of 30-45cm below the surface of the B horizon, so as to collect freshwater from both surface runoff and the perched freshwater aquifer (figure 2). Overflow from each dam is collected by further drains and fed to dams lower in the landscape. Excess water not able to be stored is discharged into a revegetated natural waterway, so as to minimize its damage to the landscape before leaving the property.

Initial drains are located according to significant landscape features and intermediate drains positioned so as to ensure adequate wind protection from the tree belts. The number of intermediate drains is determined by the gradient of the land and the height of the tree belts, on the assumption that trees can provide wind protection up to 15 times their own height on the leeward side. Under this system the paddocks on Mr. Watkins' farm, developed between the drains, are

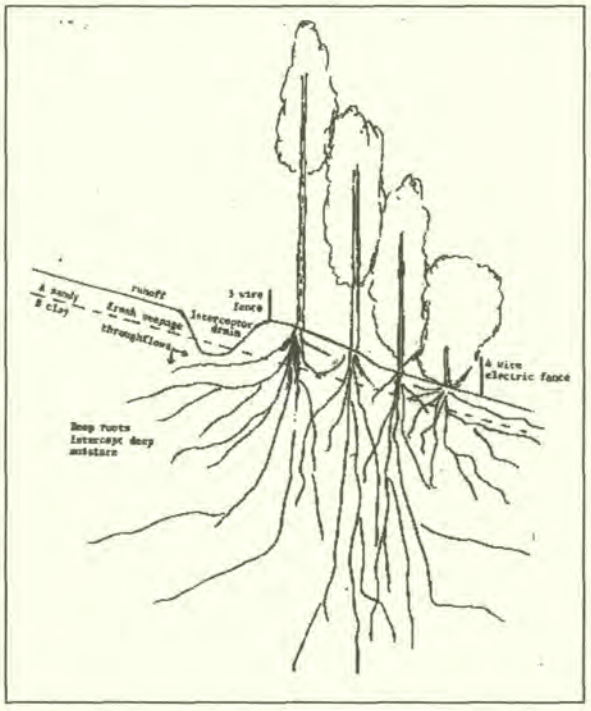


Figure 2: Cross-section of typical drain and tree belt combination.

Photo: K Johnson

An integrated approach to saving of the drylands, "Payneham", Western Australia.

approximately 30 hectares each and approximately 150-200m wide, varying with the landscape.

Tree belts

The trees planted along the lower side of the drains are initially incorporated to assist in water control, by absorbing water from the sub-soil that has not been intercepted by the drains. While this will not prevent all groudwater recharge, it is expected that in slowing down the amount of recharge the spread of saline land will be reduced and allow time for the development of perennial pastures. The trees perform the additional functions of wind protection and stock fodder, and create timber for milling and for fence posts.

A lack of sufficient research data in the early 1980s on the best arrangement and choice of tree species, necessary to perform the functions required of the tree belts, resulted in Mr. Watkins having to use his own farm as a trial site. Early drains were accompanied with three continuous rows of trees, however, a four row tree belt has subsequently proved better because it encourages deeper rooting of the middle tree rows. Future tree belts may be wider in order to enable rows of trees to be sequentially harvested without destroying the tree belts effectiveness as a windbreak. This would also create a better wildlife corridor and increase the number of "water pumps" for saline groundwater control.

Of the 38 tree species used in the tree belts the most prominent have been Spotted gum (*Eucalyptus maculata*), Wandoo (*Eucalyptus wandoo*), Golden wreath wattle (*Acacia saligna*) and Tagasaste, also known as tree lucerne. The Spotted gums are planted closest to the drains, to increase their effective height as wind breaks, and will eventually be harvested for sawn timber, pulpwood, fence posts and firewood. Tagasaste is planted on the lower side to provide sheep and cattle with green stock feed during periods of seasonal and prolonged drought, while Wandoo and Golden wreath wattles are planted in the middle to provide nectar for birds and insects, and to create a more diverse wildlife habitat.

Mr. Watkins' 1988 Churchill Fellowship into water-use management and agroforestry outside of Australia, found that deep-ripping and weed control in the planting area were the most significant factors in good tree establishment. Weed control on spoil from the drain bank is unnecessary due to the burial of weed seeds, but beyond the spoil it has been necessary to hand weed or 'scalp' the soil (removing the topsoil with a tractor blade). Spreading the spoil over a larger area may increase the success of planting, particularly for direct seeding, which in the past has proved less successful.

Seedlings are planted during winter at a spacing of 3x3m. Tree belts are weeded once more, by hand during spring, and little maintenance is required after this. Electric fences are erected on either side of the tree belts following planting (figure 2) and access tracks positioned on the lower side of the tree belts in order to minimize competition between trees and crops or pasture, and to give all weather access.

Land-use management

Better land-use management has been another ongoing development of Mr. Watkins' holistic approach. Stubble mulching has been practised for the last fifteen years and organic fertilizers are being applied in preference to soluble chemical fertilizers, in order to build up the biological activity of the soil and reduce nutrient losses through excessive leaching. Dolomite (lime) is being used to correct acidification and gypsum used to correct sodicity. Chisel ploughing is being trialled as a means of increasing root development and green manuring is occurring on irrigated land prior to seeding with lucerne.

Chemical insecticides and herbicides have been abandoned in favour of an integrated biological approach to pest control, comprising natural predation, strip grazing and hand picking of weeds. This has reduced both the time and cost of weed and pest management and is believed to improve microbial and worm activity within the soil. Dung beetles have also been released to facilitate the incorporation of manure.

Biodiversity

Another aspect of Mr. Watkins' 'Integrated Whole Farm/ Whole Landscape Planning' is the recognition that biodiversity can be better integrated into farming, bringing benefits to the long term sustainability of agriculture. Remnant vegetation and riparian vegetation, if fenced from stock and regenerated, can provide safe habitats for the recolonisation of native fauna and flora. Tree belts along the drains also create areas of habitat for small animals to live in, and act as wildlife corridors between remnant native vegetation, through which animals can travel in safety. Perhaps the greatest area of ongoing development for biodiversity is water storage dams, which in addition to providing water for stock and other uses have the potential to create a biologically rich wetland environment and a refuge for migratory birds.

Adoption

Mr. Watkins' approach has been adopted successfully on other farms in Australia. After an initial assessment to identify the significant landscape features, Mr. Watkins uses the principles of his plan to design a system that fits into that particular environment. Once the land is surveyed, the earthworks and other operations can proceed with flexibility in regard to time and choice of equipment.

Using contractors to carry out all of the work, an estimate of the cost for one kilometre of drain (table 1) is A$2,440, or A$244/hectare (excluding any water storage works). However, this can be substantially reduced by utilizing available skills, labour and equipment. Machinery can be substituted with human labour and simple digging tools, while commercial fencing materials could be replaced with living fences, such as those made from thorn bushes or other self protecting species.

The main limit is the requirement that works begin at the top of the catchment. Where land is located lower in the landscape there must be cooperation and participation of other landowners higher in the landscape if the system is to achieve its potential. However, there is the benefit that the wider the system's application over a catchment the greater the environmental, social and economic benefits of the system to the landholders. Where small landholders are involved there will need to be changes in property boundaries in order to accommodate the system, requiring even greater co-operation between neighbours.

Future plans

The plan on Mr. Watkins' farm is not yet complete, but is being installed in stages as time and money permit. Modifications are continually being made as new information from scientific research and other individuals becomes available. At this point, 17 kilometres of drains have been constructed, planted and fenced from stock, and two of the six new dams constructed. When completed, it is anticipated that the total area fenced out for drains and trees, rocky outcrops, remnant vegetation, saline areas and the laneways will be approximately 162 hectares or 30 per cent of the total area. This will leave 390ha of arable land on which Mr. Watkins plans to intensify production with irrigated horticulture, aquaculture and the development of perennial pastures.

Having installed the trees and drains to protect the farm from the damaging effects of climatic extremes, the next stage is to concentrate on the development of the soil between the macro-protection system. One component of this will be the expansion of rotational grazing, for which Mr. Watkins' farm plan is well suited, in order to better utilize his pastures.

Mr. Watkins would also like to incorporate a system of 'sabbatical farming', in which a one year 'rest' of one seventh of his arable land is incorporated into a seven year rotation.

Indicators of success

Integrated approach

The implementation of Mr. Watkins' 'Integrated Whole Farm/ Whole Landscape Planning' at 'Payneham' has confirmed the value of adopting an inter-related and whole farm approach to farm planning, rather than pursuing piecemeal solutions. The integration of land management and land-use management into this framework has enabled a better utilization of available resources, because each aspect of the farm plan is integrated with several other aspects. This also ensures that future developments are not accidentally compromised by short term goals, which in turn has made decision-making and on-ground works both easier and quicker.

Land and land-use management

Mr. Watkins' approach has also benefited from its focus on the landscape. The redesign of paddocks onto the contour has enabled easier movement of vehicles and encouraged stock to move along the contour, reducing the presence of stock paths up and down the slope which act as channels for water erosion. Dams are cheaper to construct because their location in natural depressions improves the storage ratio per cubic metre of soil excavated. In addition, the ability to locate dams high in the landscape, utilizing drains to increase their catchment area, has enabled the homestead to be supplied with gravity fed, freshwater all year round. The arrangement of tree belts along the contour has also proved beneficial with greater protection against winds from different directions than is possible with straight line plantings.

As originally intended, the arrangement of drains and dams has proved successful in providing much greater control of water. Water availability and quality were constraints prior to its implementation but these are now secure. Furthermore, soil erosion and siltation of dams has been reduced, stock and domestic water supplies increased and potentially damaging rains turned into positive events. As more dams are constructed there will be increasing potential for the expansion of irrigation through the dry season, without the risk of needing to cart water.

Waterlogging has been almost eliminated, leading to higher yields/ha, a greater area available to cropping, improved trafficability in winter and maintenance of aerobic conditions in the soil. Growth of plants on previously waterlogged soils also provides greater

Table 1:
Estimated inputs (per kilometre of drain, bank, trees and fencing)

5 hours of surveying	7 kilometres wire
2 hours of deep ripping by bulldozer	4 fence strainer assemblies
10 hours of pushing soil by bulldozer	100 fence droppers
1100 tree seedlings	16 hours labour for fence erection
10 hours labour for tree planting	1 concrete culvert (optional)
2 bags fertilizer	8 hours weeding around trees

protection to the soil from water and wind erosion. Water erosion has been further reduced by the retention of ground cover through stubble mulching and the movement of stock and machinery along the contour rather than up and down the slope.

At present, there is little research data available to quantify the influence of the system on salinisation. It is however expected, that the decrease in soil water recharge due to greater surface storage of water, and the growth of tree belts to use up deeper sources of water, will have a significant impact on levels of groundwater in the future. This will be complemented by perennial pasture species to make better use of water where it falls. Observation wells and piezometers have been installed to monitor any future change in groundwater levels.

The tree belts, combined with stubble mulching, have reduced the loss of topsoil from wind erosion, moderated climatic extremes and improved the microclimate. This has provided stock, crops and pasture with greater protection from strong winds and extremes of temperature, leading to higher yields and greater resistance to pest attack and weed competition. The fenced tree belts, while currently taking up 8 per cent of the farm's productive land, are still part of the production system, generating timber for milling, nectar for birds and bees, and stock feed during autumn at a time when green food is in short supply.

Biodiversity

Biodiversity has been increased by the planting of 38 tree species throughout the farm and the natural regeneration of many native species. Cold burns in autumn have been successful in removing introduced grasses and encouraging natural regeneration, with the reappearance of native orchids being particularly rewarding. The increased habitat created by the tree belts and the regeneration of remnant vegetation and waterways, has already had a noticeable effect on the bird population, with counts over the last seven years showing a strong increase in the abundance and diversity of bird species. While their impact on pest management has not been quantified on this farm, there is good reason to believe they are making significant contributions towards controlling pest species.

Economic response

While many in the rural community continue to question the economic viability of landcare, Mr. Watkins remains adamant that land owners have a moral obligation to care for the land, regardless of economics. In seeking to first secure the health of the environmental resource, he believes the economic aspects will eventually prove beneficial, and with good reason.

The more efficient utilization of resources under his system has actually improved the economic outlook, without compromising on the health of the environment. Rather than continuing to make economic gains off a decreasing environmental resource, the system is maintaining the economic gains while building up the health of the environment. The long term benefits of this will be greater financial security of the farming enterprise and a healthier environment for both humans and animals.

Despite many hectares of his farm having been fenced off, carrying capacity has actually increased by 10 per cent and a greater area become available for cropping. Furthermore, an economic analysis of 'Payneham' found that gross margins for crops were more than double the local average and for sheep almost four times the average. Other farmers adopting the system have also shown it to be economical, with considerable benefits apparent on previously waterlogged soils within the next cropping season. One Frankland farmer recorded a 25 per cent increase in gross income within 12 months, following implementation of Mr. Watkins' system.

Social response

Before Mr. Watkins implemented his innovative plan, he was supporting one family on a farm considered economically unviable for the region. The perception was and continues to be "get big, or get out", with farmers being expected to purchase other farms in order to meet their own needs and to provide for their children. As properties have expanded to cope economically, the rural population has declined, facilities in country towns have diminished, and the land has become further degraded.

Rather than follow this extensive and financially crippling approach, Mr. Watkins chose to invest further in the land he already owned, by implementing his new system. As a result, the farm may now be able to support two or even three families. This potential to intensify and diversify output has been made possible without the need for enormous inputs of fertilizers, chemicals or Government handouts. Rather than being forced to expand to survive economically, Mr. Watkins has demonstrated that by caring for the land it can sustain a greater population, giving hope that the rural community may be able to reverse its present decline.

Conclusion

Ron Watkins system of 'Integrated Whole Farm/ Whole Landscape Planning' is an innovative, effective and holistic approach to the problems of land degradation and the need for better farming systems. The system benefits all aspects of the farming ecosystem; soil, water, macro and micro climate, plants and animals, native flora and fauna, as well as social and economic aspects. In so doing, it makes substantial progress towards sustainable use of the land. The system is flexible but specific to the land on which it is installed, and can be adapted in both commercial farming and smallholder areas. After 15 years in the field, it is still ahead of every alternative approach. In bringing the innovation to the attention of the public, through numerous farm tours, guest talks, media coverage, and international and national awards, Mr. Watkins has contributed significantly to the understanding of the causes of specific land degradation problems and the development of practical solutions to those problems.

Acknowledgements

Much of the information in this article has been extracted from the 'Success Stories Evaluation Mission' Report prepared for the United Nations Environment Programme by Tony O'Brien, Senior Specialist Consultant (International), Sharnae Research Centre, and Michael Whereat, Principal Consultant, M.N. & M.J. Whereat and Associates. I also gratefully acknowledge the assistance of Mr. Ron Watkins, Dr. Richard Bell and Mr. Tony O'Brien in preparing this article.

Bibliography

Land Management Society, 1990, *Directory of Innovations and Land Management Practices: Farmer No. 2*, Land Management Society, Perth, Australia.

Land Management Society, 1991, *Tree and Water Combinations in Five Countries: A Farmer's Report*, Land Management Society, Perth, Australia.

United Nations Environment Programme (UNEP), 1994, *Success Story Evaluation Mission Report on Ron Watkins' Farm 'Payneham', Frankland, Western Australia.*

Yeomans, P.A., 1968, *Water for Every Farm*, Murray Books Pty Ltd, Ultimo, Australia.

Survival with Moving Sands: The Northern Province Community Forestry Project Ed Debba - Sudan[1]

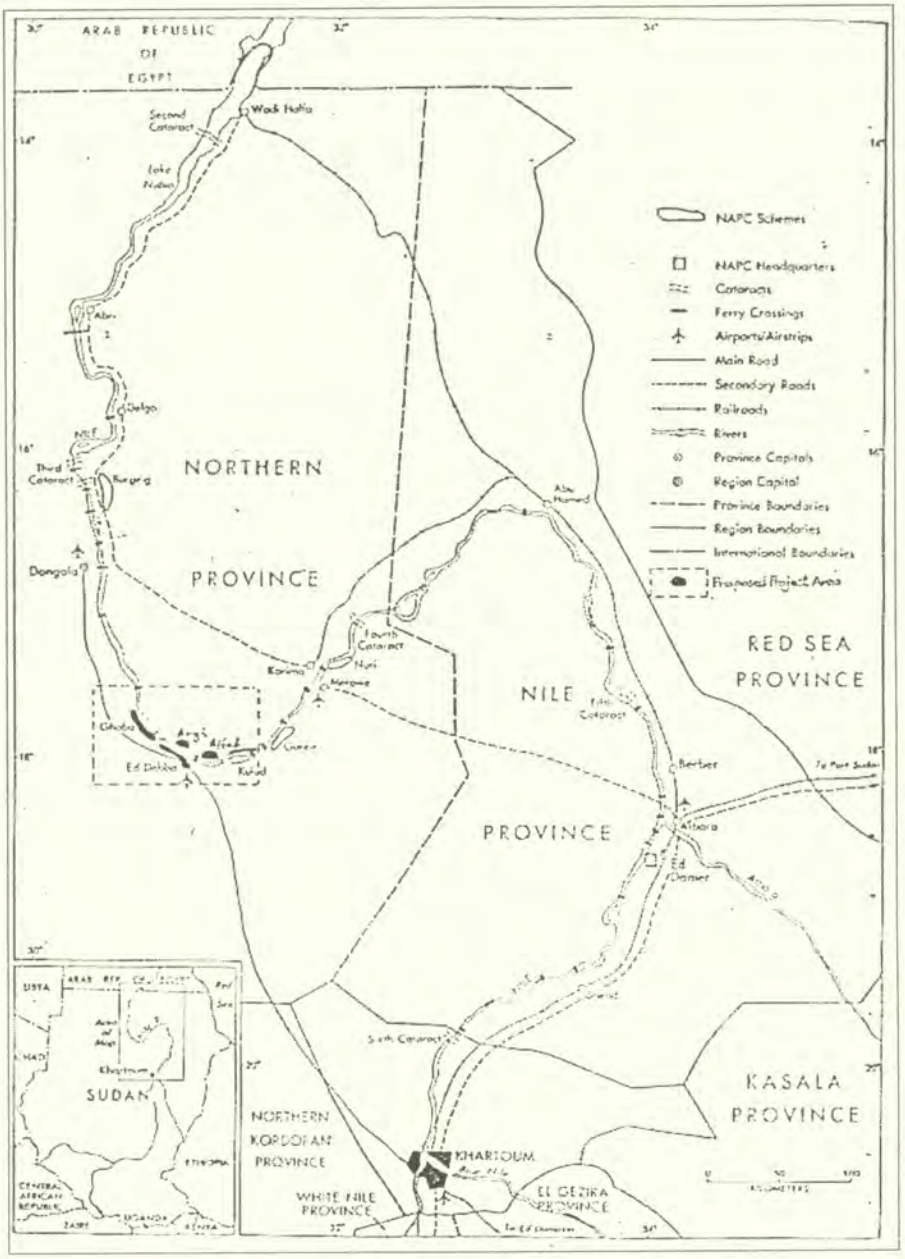
Compiled by:

Mohammed Abdel Mahmoud Ibrahim,

NPCFP, project manager

Introduction

Since 1988, SOS Sahel's Northern Province Community Forestry Project (NPCFP) has been working with agricultural communities in the Nile valley around the town of Ed Debba in the Sudan (map 1). Several of the highly fertile farming areas along the river are being gradually buried by encroaching desert sand. Mobile dunes creep forward onto cultivated land, and wind blown sand damages crops and machinery, fills wells and canals and buries houses. Farmers are determined to cultivate more land, and open up new sites on the exposed desert plain and among the dunes, but the harsh environment too often prevails. The process of desert encroachment, in the project area, has been occurring over many decades (oral history) but has been exacerbated in the last 40 years by tree cutting, over grazing and the control of river flooding. Amongst other things, this problem, combined with the very high land pressure on the narrow strip of fertile land along the Nile, translates into



Map of Sudan showing Project Area

[1] Winner of UNEP's Saving the Drylands Award 1996

a challenge of a shrinking economic base. In some cases the loss of natural vegetation has resulted in such serious sand encroachment that the survival of entire communities is threatened. The severity of the problem varies from site to site and is generally at its worst where villages and farms are exposed to the prevailing North winds. Until the time of project intervention, the rural people of the area were trying to solve this problem by building mechanical fences of dead-date palm leaves and mud-walls which were neither cost effective nor sustainable as they demand a lot of labour time for maintenance. Besides, the people had very limited technical knowledge to design and manage tree shelterbelts. As a result, the majority thought that this was a hopeless situation and lived a life of constant fear and uncertainty as they could be forced to move to another place every few years. Over the project implementation period, the project has successfully managed to grow sustainable tree shelterbelts and wind breaks and to stabilize dunes. In the process, it has demonstrated to the communities that they can help themselves to protect their own environment.

The origins of the project

The NPCFP was based on the success of SOS Sahel's village Extension Scheme, in Shendi, the Nile Province - Sudan, where work started in 1985. The regional government and IFAD invited SOS Sahel to undertake a project in the Northern Province in identified agricultural areas; Affad, Argi and El Gahaba among those worst threatened, as the local communities of these villages approached the government authorities for help. During phase 1 of the project, villagers from outside the original project area approached staff for assistance with seedling production and technical advice for shelterbelt establishment and dune stabilization. Activities were expanded to include the villages of Abkor and Tergis in phase 1. Project staff have researched the new areas of phase 2 to assess the demand for forestry activities. New villages of phase 2 include; El Hau, Kuri, El Sidir, Takar, Mora, Rekabia, Nafaab, El Arki and Gilass. Many of these villagers have already bought seedling produced by the project during phase 1, but lack the technical expertise and inputs such as seed, polybags and irrigation equipment to produce sufficient seedlings and establish shelterbelts. Phase 2 proposals were prepared by the senior management of the NPCFP in close cooperation with extension workers and villagers. They are based on experience to date, the results of monitoring and evaluation visits, interviews with women and men at proposed sites, and comparative studies of the costs and benefits of different irrigation techniques.

Climate and environment

The environment in which the project is located is hyper-arid. Potential annual evapo-transpiration of over 6,000 mm far exceeds average rainfall of less than 20 mm. From April to October temperatures are very high with average daily maxima reaching 43ºC in June, and there is a brief cool winter with average minima down to 9ºC in January. At present, the environs of the project area is desert with successive waves of sand dunes moving towards the banks of the river Nile. In some cases sand is moving at a phenomenal rate of 25 metres per annum in the process burying land for both agriculture and settlement and any infrastructure on the way. The wind which causes the greatest sand movement is the northerly, or north-north-easterly, which blows from October to May, and is at its worst from February to May. During the remaining months there is a more variable south or south-westerly wind which is generally less effective at moving sand. Sand and sand dunes in the area are of variable form, varying from simple sand sheets and zibars to longitudinal massive dunes or barchans, the common moving type. Dune sizes range from a few centimetres of moving sand sheets to massive barchans or complex forms of up to 40 metres in height and a few kilometres in length.

Project area and objectives

The project area comprises a narrow band of flat land along the Nile river with villages on both sides and the desert area immediately around it. With life in the Northern Province of Sudan centered around agriculture along the Nile valley, land for both agriculture and human settlement is getting smaller and smaller and less productive by the day. This is mainly due to three factors: natural population increase, loss of land through desert encroachment and the general aridity of the environment which makes the availability of suitable agricultural land a problem.

The project aims to deal with the environmental problems of the area as follows:

- To save agricultural land and land for human settlement from desert encroachment;
- To recover land already buried by the desert thereby increasing land available for both agriculture and human settlement;
- To protect infrastructure such as houses, schools, clinics and wells from inundation by moving sand.

Villagers in the project area have been complaining of the loss of irreplaceable fertile land for many years, but sufficient funds and resources at both the local and national levels are not available to deal effectively with the scale of the problem.

The project objectives were carefully designed to deal effectively with the problems as follows:

- To enable people throughout the project area to grow shelterbelts, wind breaks and to stabilize mobile dunes, to protect farm land and homes from burial by sand;
- To demonstrate to the communities in and around the project area that they can help themselves to protect their environment, improve agricultural production and enhance the quality of life;
- To ensure availability of sufficient seedlings of suitable species to meet needs through the project area;

- To raise awareness of the importance of natural vegetation and the need to protect it;
- To develop shelterbelt management techniques for the full use of fodder, fuel wood and poles;
- To raise interest in the potential of farm wind breaks and agro-forestry in the area;
- To encourage women to play a part in protecting the environment, and to increase their income from small-scale income generation from tree products, to improve conditions in kitchens and reduce fuel consumption by introducing improved stoves;
- To enable women and men to grow seedlings in small private nurseries for their own use and for sale;
- To encourage planting of amenity trees throughout the project area;
- To hand over nurseries, shelterbelts and wells to communities on a sustainable basis.

Project activities:

Extension

Extension work is vital to the project's success, and all the staff, including foresters and managers, are involved in the extension programme. The aim is to inform and educate the public about the value of tree planting and protection of the environment, and to arouse interest and participation in project activities.

During phase 1, much of the project's success has been achieved through extension contacts with individual men and women, but in phase 2, as the project aims to reach a larger population, group contact is the common practice. Project staff - after training have the necessary skills and confidence and the ability to organize logistics. A mobile exhibition is used to present the full scope of the project's work in an attractive and exciting way, and slide shows filmed at the project, convey messages on specific aspects of the work. Good quality posters with simple messages in Arabic are used in schools and public places. A puppet theatre as well is used to deal with specific problems in the area.

When work starts at a new village, the mobile exhibition is used to convey a broad message, raising awareness and drawing attention to the scope of the work and the opportunities the project can provide. Site visits and informal meetings with interested farmers and women have helped in identifying the needs and problems of each village.

The extension team uses a set of simple, written messages supported by drawings covering all aspects of work. Project messages have been modified and updated regularly in the light of current practical experience and the results of ongoing practical trials. The extension programme is operational throughout the project's area. The messages and practical training offered to women, men and schoolchildren are as outlined below:

The women's programme

The following messages have been given to interested women throughout the project area:

- Seed collection, storage and treatment;
- Make and maintenance of small private nurseries;
- Seedling production of a wide range of multipurpose species;
- Planting of trees around home and village;
- Raising awareness about the causes and dangers of desertification;
- The use and make of improved charcoal and wood burning stoves;
- Marketing of seedlings for small income generation;
- Participation in the work of project nurseries and planting sites.

Women have been enthusiastic participants in project work, especially in seedling production (table 1). Some private shelterbelts have been planted by individual women, and some women's groups have participated in mechanical fence installation at communal sites. They have also been able to generate a useful, small income from the sale of seedlings, but transport and marketing have always proved problematic.

The life of women in Northern Sudan centres around the kitchen. Where wood is a more important cooking fuel than charcoal, the project has considered the economical use of fuel-wood and has raised awareness among women of the connection between fuel use and desertification. The introduction and dissemination of charcoal stoves and wood burning stoves has been one of the project's main achievements.

Table 1:

Seedling production for the period 1988 - 1995

Nursery type	Location	Phase 1 1988 - 1991	Phase 2 1992 - 1995	Total
Main	Affad	30,686	35,306	65,992
Nurseries	Argi	22,986	26,778	49,764
sub-total		53,672	62,084	115,756
Medium size	El baja	6,402	5,597	11,999
Nurseries	Abkor	4,380	00	4,380
	Mora	00	1,546	1,546
sub-total		10,782	7,143	17,925
Extension	All project	29,928	50,319	80,247
Nurseries	Sites			
Grand total		94,382	119,546	213,928

The men's programme

The extension messages and practical training have been given to men throughout the project area include the following:

- Seed collection, storage and treatment;
- Make and maintenance of small private nurseries;
- Planting of trees in sheltebelts and wind breaks;
- Stabilizing mobile dunes, protection of farm land and houses;
- Raising awareness about the causes and dangers of desertification;
- Shelterbelt management;
- Participation at the project's main nurseries;
- Motivation, organization and management of communal shelterbelts.

The extension teams visit sites where private or communal planting is proposed. They discuss with farmers their needs and objectives and then give advice on technical points such as; the position of shelterbelts, suitable tree species, spacing and number. They also decide on irrigation methods and frequency, protection of trees from wind and animals and the construction of sand fences where necessary. They also discuss with farmers project inputs which may be required and the kind of participation that will be provided by them as beneficiaries.

The school programme

The extension team have contacted almost all the schools in the project area, the extension method included classroom lectures and slide shows, puppet theatres and practical exercises and visits to sites of interest. The extension messages and training for schoolchildren were elaborated in simple forms. Schoolchildren have played a valuable role in the work of project nurseries and shelterbelt planting. Occasionally, schoolchildren do the job for their parents when the latter are busy on the farm during the peak of the cropping season. The most important thing involving the children is that they have developed an understanding on the mechanics of the desertification process and its control and it is hoped that they will pass on this knowledge to future generations.

Seedling production

Adequate production of a suitable range of indigenous and exotic tree species has been essential to the continued success of the entire programme. Seedlings have been produced at three types of nurseries; the project's main nurseries at Affad and Argi; the medium-sized nurseries at El Baja, Abkor and Mora; and numerous small extension nurseries belonging to private individuals throughout the project area.

Project main nurseries

The Affad and Argi nurseries have a capacity of 24,000 - 18,000 seedlings respectively. They produce most of the seedlings required for planting shelterbelts, sand dune stabilization and wind breaks/live fencing.

The main species used are; *Prosopis chilensis* (abandoned in 1995), *Leptadenia pyrotechnica, Acacia mellifera, Acacia seyal, Balanites aegyptiaca, Eucalyptus camaldulensis, Pithecillobium dulce, Azadirachta indica and Albizia lebbekh.* Each nursery is managed by a single trained nurseryman recruited from the local community, and assisted by a trained pump operator who is also responsible for shelterbelts, wind breaks and agro-forestry sites attached to the nursery and watered by the same pump.

Seedlings from the main nurseries are sold at half price to farmers within the project area, and at full price to those outside. Usually, seedlings for communal sites such as external shelterbelts are given out free. Main nursery seedling production for project phases 1 and 2 is shown in table 1.

Medium sized village nurseries

Small nurseries, with capacities of about 4,000 seedlings have been constructed at Abkor, El Baja and Mora villages. They use existing water supplies for irrigation, and local materials for their shade structures. The range of species is similar to that of the Affad and Argi main nurseries. These small village nurseries are managed by a single, trained nurseryman, who doubles as an extension worker, visiting planting sites and acting as the local point of contact.

Extension nurseries

Small private nurseries at homes and on farms, producing anything between 10 to 500 seedlings. During the project's phases 1 and 2, more than 3,200 small private home nurseries have been started by women and men in the project area. The project provides polybags and technical training for nursery owners.

The extension nurseries have several striking advantages: they provide a valuable practical training for individuals who may never have grown seedlings before. Such skills may prove valuable after the project has ceased to operate. The extension nurseries provide an opportunity for those who do not wish to buy seedlings from the project nursery, or those who want particular species which may not be available. They generate a small income, particularly if species are grown which are in high demand. Such nurseries have the potential for long-term sustainability. Extension nurseries produce all the species mentioned at the project's main nurseries, in addition to which they also produce fruit and ornamental species such as; *Citrus aurantifolia, Psidium guajava, Bougainvillea* and others.

Planting and irrigation

Farmers in some villages have considerable experience of tree planting, and many useful shelterbelts are planted independently. But some mistaken practices are also commonplace. In some cases, planting can actually trap sand on the land the farmer hoped to protect. There is thus a clear role for the extension team at all planting sites where they explain the best techniques of planting according to the project's experience and observations to date, bearing in mind that the project can also learn from the farmers.

As the project objectives were well focused to tackle the problem of land shrinkage due to desert encroachment and to improve the microclimate, the

following tree designs were used:

- External shelterbelts
- Internal shelterbelts
- Sand dune stabilization
- Farm protection and wind breaks

External shelterbelts (ESB)

External shelterbelts are located to the windward side of dunes and scattered villages. The aim of these plantings is to protect the villages from sand accumulation and to cut off drifting sand before it reaches the main dune and agricultural area. The planting sites of external shelterbelts are extremely harsh, with saline and sodic soils, high topographic exposure, sand blasting and rodent and livestock damage.

External shelterbelts are always located on communal land. The main constraint to planting is the lack of irrigation sources. Therefore, project personnel have to negotiate with the beneficiaries exactly what inputs will be provided by each side. At the beginning of phase 1, the project took on the burden of digging the wells, and the installation of deep bore pipes and the purchase of pumps and accessories, while the communities provided the labour for planting, cleaning of furrows or pits and irrigation. Poor participation was reported at some villages, which made the project change its policy towards the level of inputs for any future involvement. In phase 2, the village people have to dig the well and the project provided the pump and accessories, this it was hoped would stimulate the community's future participation in the activity.

External shelterbelt irrigation systems started with the traditional canals and furrows, but are no longer used as they require constant labour for cleaning away accumulated sand. From the beginning of phase 2, the project introduced the use of flexible hoses connected directly to pumps, these have not only saved on labour for the cleaning of canals and furrows, but have conserved valuable water against evaporation and seepage.

Usually, external shelterbelts take two to three years to establish themselves depending on the depth of the water table, which is normally nine to 15 metres underground.

Considering the harsh conditions for the external shelterbelts, the project has found that the installation of mechanical fences is a pre-requisite, as they protect new seedlings from sand burial and damage by sand-blasting. Local materials used in sand fences include date doulm palm leaves and tarfa twigs. Mechanical fences need to be renewed where necessary (Photo 1)

Internal shelterbelts

Internal shelterbelts form the first line of defence and are located at the foot of the moving dunes close to the fertile agricultural land. Participation among farmers is very high, as individual farmers are anxious to protect their land. After the first planting this type of shelterbelt, becomes common, because the farmers/ landowners feel the immediate benefit. Internal shelterbelts are irrigated by private matara wells, or by project assistance which provides portable water tanks. Internal shelterbelt sites are usually relatively easy to develop as they are situated on fertile soils with shallow water tables. Trees can generally be established within about nine months with irrigation.

Sand dune stabilization

Sand dune stabilization is used when an active dune or dunes are threatening an object in need of protection. Mechanical and biological means are both used in this activity. The purpose is to protect farms within the dunes, and reduce sand encroachment onto the main area consisting of irrigated land and houses. Sometimes is used to extend the life of internal shelterbelts. Mechanical fences need to be renewed annually, and strong commitment from the farmers is of a great importance for the success and continuity of the intervention. Irrigation largely depends on the project's mobile 4WD water tankers, and private matara wells where available. The project provides flexible hoses on rotational basis for farmers with matara wells nearby and between the dunes. Project personnel have learned valuable technical lessons about sand fertility, minimum water requirements and the depth of sand required for seedlings to successfully establish themselves. The intervention is very popular especially at sites where land hunger is very high, where farmers use the technique to open up new lands in

Photo 1: Mechanical fences are important for sand stabilization, but need to be renewed annually, Abkor village site.

Photo 2: Sand dune stabilization site at Argi village.

former buried fertile soils. At Argi village alone, about 9,000 date palm trees have been grown on such reclaimed land since the project started (Photo 2).

Farm protection and wind breaks

Farm protection is widely used on the river's west bank in the area between Ed Debba and El Gahaba. New farms in exposed desert areas use double or triple rows of Mesquite shelterbelts around farms. Eucalyptus and Leucinea are used as wind breaks within farms. Farmers have reported that shelterbelts and wind breaks are effective, and have reduced farm crop irrigation. It has become evident that extending irrigation intervals from five to 10 days, there is a notable increase in crops and fodder production.

Effectiveness and durability methods used

After a period of one and a half years of irrigation support, Mesquite shelterbelts and Eucalyptus wind breaks are fully established and very effective. However, sand fences are not durable as they need to be maintained regularly. As a result, sand fences which were also used traditionally by the local people, are only used as a complimentary or preparatory method prior to the establishment of tree shelterbelts. Thus shelterbelts are an improvement on the traditional method of retarding desert encroachment. Wind breaks inside the Nile basin where land is suitable for agriculture were found to have a much lower degree of success. This is due to natural factors such as grazing pressures arising from farmers driving their animals to the fields for grazing soon after harvesting their crops and the requirement for irrigation during summer which unfortunately, commands a lower opportunity cost to the farmer when compared to irrigating other crops. That is farmers tend to give priority to spending their time and resources irrigating crops rather than wind breaks (Photo 3).

Tree species used by the project and their biological diversity

Proposis chilensis the Mesquite tree was used for shelterbelts while Eucalyptus camaldulensis was planted for wind

Photo 3: The Mesquite species has a high rate of telescopic growth lending it advantage over other tree species. Internal shelterbelt site at Agri village.

breaks. Prior to the wide use of these species, the project had experimented with 18 other indigenous and exotic species. Of late, the project has even intensified the search for other species particularly to diversify tree selection for shelterbelts. This has been precipitated by a date that has arisen in Sudan centred on whether Mesquite is the most appropriate species to ameliorate the problem of desert encroachment in the country. One school of thought is of the opinion that in the same manner as the desert is a threat, Mesquite is also a serious threat to arable land since it is a potential weed whose seeds are easily dispersed by animals through their droppings, particularly if these droppings are deposited on moist land. Herbivores feed on Mesquite pods which have been found to be very nutritious fodder for them. The other school of thought believes Mesquite is the most ideal species and therefore advocates its use in the fight against desert encroachment particularly in the Northern Provinces of the Sudan where there is little rainfall. It is not advocated for other parts of the country which receive relatively high rainfall. One of the reasons for the continued use of Mesquite along the Nile in the Northern Province is the observation that there is critical land hunger for crop cultivation along the Nile basin and Mesquite will be controlled by the farmers themselves who have plenty of incentives to weed it out if it happens to grow on farms.

Economic and social benefits from a land-use point of view

The project has had a tremendous impact in terms of saving approximately 630 hectares (1,556 acres) of land which would have been lost or buried if there had been no intervention. The size of the land saved continues to grow at the rate of 25 per cent per annum. In addition, the project managed to reclaim approximately 150 acres of land which had already been buried by sand and abandoned by the villagers. Assuming that this land is put to good use through the production of date palm, the main cash crop in the area, it is estimated that the project is generating an annual income of around US$ 3 million for the local community. At the household level, farmers have reported an increase of between 50 per cent to 100 per cent in wheat yields resulting from amongst other things, improved cross pollination and the general improvement of the micro-climate brought about by the planting of wind breaks. It is estimated that the project has secured the settlement of 52,000 people who could have been displaced from the project area if there had been no intervention. As the villagers experience a sense of security and peace of mind, more decent houses are being constructed in the project area.

Cost effectiveness of the innovations

The planting of shelterbelts and wind breaks to stop the advancement of the desert was assessed to be cost-effective and very worthwhile (UNEP evaluation mission 1996). For instance, it was noted that from 1988 to 1995, approximately US$1.5 million was spent on water pumps, management and other expenses by the donor. UNEP evaluation mission (1996) assuming in very crude terms, that the villagers injected an equivalent amount of labour cost to match these funds and that all this money is invested in just one year, the annual rate of return on investment is over 100 per cent. This means, if one invested US$ 3 million in a project of this kind, then one would expect earnings of US$ 3 million in return on an annual basis for an indefinite period, this of course, ignoring factors such as the time value of money, exchange rate movements, etc. The return on investment is more pronounced when social and development benefits are considered, e.g. infrastructure saved from burial by sand. Fodder for animals and shade provided by planting trees and recreational facilities created by reclaiming land buried by the desert are also major considerations. The shelterbelts do not require additional expenses for maintenance. The Mesquite trees continue to grow naturally as they tap water from deep down in the water table using their very long roots.

Community involvement in project planning and implementation

The community was involved in most of the stages of project planning project identification, feasibility studies, project designing and appraisal, fund-raising, implementation and monitoring and evaluation. The project was based on the needs of the people who were under a real threat of loss of land for agricultural production and settlement by desertification. In response to this identified need a team of experts from SOS Sahel travelled to the project area for a needs assessment and a baseline study. Having informed the authorities of the Northern State, the local council for Ed Debba, SOS Sahel went into direct communication with the affected community or target group of local farmers and villagers. The project staff consulted the village elders first as they are the most powerful figures in the community.

A public introductory meeting drawing over 1,000 people was then held to discuss the findings of the baseline study and to plan what was to be done. With good ideas and well outlined plans in both SOS and the villagers' minds, SOS then facilitated the formation of village committees comprising very active people chosen by the villagers themselves.

Emphasis on decentralization and devolution of powers was strengthened. In this regard, the project supported government efforts to strengthen decentralized development. Locally based environmental management for rural development was aptly demonstrated in the process.

In keeping with the local culture and tradition of restricted direct working relationships between men and women, women villagers formed their own village committees with specific complimentary input to the project.

The role of the farmers' committees was to call people for community participation, to help in decision-making regarding the location of shelterbelts or where to effect dune fixation (which gave the villagers a sense of ownership), to convene meetings amongst villagers and

with SOS Sahel project staff and generally to help in the strategic planning process and mobilization of labour which is a form of indirect fund-raising for the project. The project staff together with the villagers monitor and evaluate project progress through meetings which can either be called by SOS Sahel project staff or by the villagers themselves whenever they think there is a problem.

To enhance the commitment of the villagers during phase two of the project which was aimed at extending the gains from the earlier phase, SOS Sahel asked the villagers to dig up wells in return for assistance with water pumps. This has catalyzed villagers into establishing their own shelterbelts with little participation of the project. This community empowerment has energized locals to seriously take part in the implementation of this natural resource project.

The rate of adoption of the innovation and reasons

From the figures given in table 2, it is noted that targets for the production of seedlings were exceeded in both phases and the reasons given for this include the high participation and enthusiasm of women, which is attributable to the fact that seedlings produced in home nurseries are sold therefore generating income for the women. In addition, the scene of hope that something could be done about the encroaching desert, generated enthusiasm amongst farmers/villagers to plant their own shelterbelts creating more demand for seedlings. If it were not for the damage caused by floods in 1994, the targets for internal shelterbelts were otherwise exceeded in both phases of the project. Since internal shelterbelts constitute the most direct interface between the farms and the sand dune front and since whoever plants a shelterbelt owns it, incentives to participate in the establishment of internal and intermediate shelterbelt constitute the most direct interface between the farms and the sand dune front and since whoever plants a shelterbelt owns it, incentives to participate into the establishment of internal and intermediate shelterbelts is very high. On the other hand, it was observed that the degree of participation in the establishment of external shelterbelts was rather low. External shelterbelts are planted a considerable distance away from and behind internal shelterbelts, which form the divide between farms and the desert. In some cases where the planting of external shelterbelts exerts too much pressure on the supply of labour from the local communities, especially in sparsely

Table 2

PHASE ONE 1988 -1991 ACHIEVEMENTS:

ACTIVITY	PLANNED	ACHIEVED	COMMENT
Village and home nurseries	1800	2420	Due to increased demand, 620 more nurseries were planted
Internal and intermediate shelterbelts	24 km	26.545 km	There was more participation by farmers
External shelterbelts	8 km	6.10 km	There was low participation
Wind breaks and private farm protection	14.5 km	13.998 km	On target and farm protection very popular
Charcoal stoves	500	500	Progress was made to produce these locally

PHASE TWO 1992 - 1995 ACHIEVEMENTS:

ACTIVITY	PLANNED	ACHIEVED	COMMENT
Village and home nurseries	800	823	Due to increased participation by women more seedlings were produced
Internal and Intermediate shelterbelts	14 km	8.186 km	7 km were destroyed by 1994 floods
External shelterbelts	6 km	5.82 km	Low participation was anticipated
Wind breaks and private farm protection	16.5 km	12.11 km	Although target was extremely high, enthusiasm and high participation was observed
Charcoal stoves	500	500	The stoves were made locally by the women

populated villages the project has assisted by paying extra labour time. As shown in table 2, the adoption rate of the intervention is about 20 per cent. Almost all the farmers in the project area are actively involved in the pilot project and others have begun to establish shelterbelts for themselves following demonstrations by the project.

Demographic and sanitation issues

Through the project's intervention a total of 52,000 people are currently occupying land that was saved and reclaimed by the project.Without this intervention, they could have been forced to move elsewhere. For example, in one village, Argi, the villagers approached the local authorities requesting permission to move to a new area because both the housing infrastructure and arable land around the village was under threat of burial by sand, but no sooner had the permission been granted then the project intervened. The village has now grown from a population of 8,000 to 12,000 people, 1,900 of whom have come from other villages and towns where they were engaged in marginal jobs.

The living conditions of the villagers were improved as a result of the project. For example, the villagers are beginning to build new houses of good quality because they now have a sense of long term security. In one area as many as 15 new houses of better quality have been constructed.

Commitment of the community to sustainable development

The involvement of children at an early stage in the fight against the problem of desertification ensures that they are both mentally prepared and physically equipped to maintain an interest in, and a sense of proprietorship of desertification control measures.

The project itself is based on the understanding that development cannot be achieved unless the participants are its architects, meaning that the people themselves are responsible for protecting the environment and improving agricultural production. The degree of enthusiasm and voluntary participation by the people in various activities proposed by the project assist in defining priorities, the work plan and the project's allocation of resources. The sense of ownership is evident by the very high rate of adoption of the innovation by the villagers and the number of people from surrounding villages who have approached SOS Sahel for assistance with the technical know-how to fix dunes and to plant and manage shelterbelts on their own.

Although labour and finance to purchase water pumps for harnessing water (particularly in areas further away from the Nile) is not always sufficient to deal with this enormous problem, people are always keen to provide labour as a counterpart contribution to those able to put up other resources. Many villagers have now successfully started to establish shelterbelts on their own private farms outside the project area using technical knowhow from SOS Sahel.

Project funding:

International Fund for Agricultural Development (IFAD) has provided a major proportion of project's funds through a loan to the Government of the Sudan, as part of it's Northern Region Agricultural Rehabilitation Programme (NRARP), rather than a direct grant to SOS Sahel. In general, IFAD had covered 50 per cent of the project's expenditure, paid in local currency to cover project's in-country expenses for phases one and two. Inflation, running at approximately 70 per cent per year, has significantly eroded the value of IFAD's fixed local currency contribution. Therefore, SOS Sahel had successfully sought additional finance from other sources for example, Tree Aid, ODA.

The other 50 per cent of funds had been covered in hard currency. The Rotary 3H, have paid for all phase one overseas costs, while the Netherlands Government have paid for phase two.

NEWS FROM UNEP

UNEP's Effort Towards the Implementation of the United Nations Convention to Combat Desertification 1995-1996

The present report is structured according to the four programme foci for desertification control activities approved by the Governing Council at its 18th session: the assessment of land degradation; improving global awareness of dryland and desertification issues; promoting action in support of the UNCCD, and improving understanding of the social dimensions of land degradation and promoting sustainable practices of land management. During 1996, progress has been constrained by lack of available resources. Nevertheless, progress has been achieved.

Assessment of land degradation

Three regional pilot projects and training centres in Africa, Eastern Europe and West Asia were established for soils and terrain database compilation and the interpretation of land degradation assessment, the risks of soil erosion and food-producing capacities. An assessment of the status of human-induced soil degradation was completed in 15 countries in South and South-East Asia at a scale of 1:5 million. Work on updating of the UNEP database on desertification continued and the material is being prepared for use in the production of a revised *World Atlas of Desertification*.

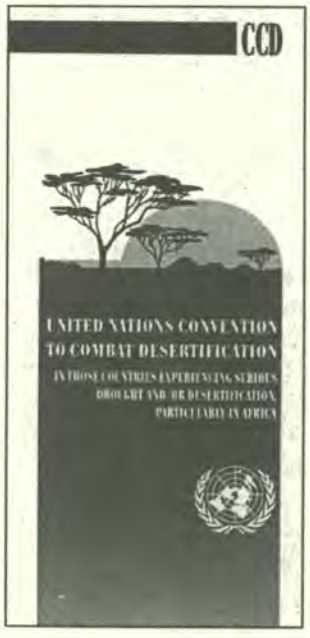
UNEP, as part of a global initiative, supported activities in eight southern African countries to compile and evaluate soil and water conservation practices and disseminate information on sustainable soil and water conservation systems to countries with similar environments. The Kenya National Land Degradation Assessment and Mapping project, funded by the Government of The Netherlands and hosted by UNEP was completed.

UNEP continued to work closely with other organizations, including the United Nations Educational, Scientific and Cultural Organization (UNESCO), on enhancing knowledge on soil biodiversity for sustainable tropical agriculture; with the United Nations Research Institute for Social Development (UNRISD) in preparing a policy paper on environment and rural development and with the Food and Agriculture Organization of the United Nations (FAO) on guidelines for integrated planning and management of land resources. In addition, UNEP sponsored an expert workshop to assess the prospects of carbon storage in dryland soils and its impact on mitigating climate change. The results are to be published.

Awareness-raising

During the period under review, major focus was given to planning, contract negotiation and implementation of a project to produce a revised version of the *World Atlas of Desertification*, based on an updating of the UNEP database on desertification. The Atlas will be published in 1997, in paper and electronic formats.

Three issues of the *Desertification Control Bulletin* were issued, the special issue of *Our Planet* on desertification was reprinted and a summary pamphlet of its contents was produced. Work was completed on the publications *Social*



Aspects of Sustainable Dryland Management, the *Directory of Arid Lands Research Institutions* and *The Social Dimensions of Desertification: An Annotated Bibliography and Literature Review*, and copies of publications and other documents on desertification control were widely disseminated, by post, at major international conferences, INCD sessions and technical meetings.

UNEP also used the major international conferences to distribute other material on desertification. In cooperation with Television Trust for the Environment (TVE), two films highlighting the effects on women of desertification were made for the fourth World Conference on Women, two on rural-urban migration for the United

Nations Conference on Human Settlements (Habitat II) and one on drylands and food security for the World Food Summit.

An awareness-raising programme on the drylands targeting younger children, including a jigsaw, quiz and puzzle book, as well as information and display material, was presented at the Eastbourne Children's Conference, which was co-sponsored by UNEP and British Airways.

UNEP has entered into partnership with the Government of the Republic of South Africa and the national non-governmental organization (NGO) focal point on desertification to develop community-based awareness campaigns as part of preparing the national action programme on desertification control. Resources are being sought in the private sector for the campaign.

During 1995, UNEP began a new initiative focusing on gender and the environment. In cooperation with the UNEP gender focal point and the Environment Liaison Centre International (ELCI), a pilot project on gender and desertification was prepared for submission to donors. A desk-study of available studies and literature was completed.

As the task manager for reporting to the Commission on Sustainable Development on progress in implementing chapter 12 of Agenda 21, UNEP has prepared the new thematic report on desertification for the five years after the United Nations Conference on Environment and Development (UNCED), for discussion in 1997.

Six regional training courses and workshops were organized on the management of dryland natural resources, sustainable food production, monitoring and assessment of desertification, expansion of new technologies and the provision of public information. A total of 232 participants from developing countries received instruction.

Promoting action

UNEP participated actively in the sixth, seventh, eighth and ninth sessions of the Intergovernmental Negotiating Committee for the Convention to Combat Desertification. UNEP continued to support the interim secretariat and its regional consultations. Collaboration with and support to NGOs continued, with participation in the NGO Network on Desertification (RIOD), in village-level projects and for NGO attendance at the INCD sessions. UNEP has also offered to provide administrative support for the permanent secretariat for the Convention.

UNEP gave major focus to urgent action for Africa. In cooperation with the various subregional organizations, meetings were held to coordinate activities at subregional level, to launch subregional action-programme preparation and to determine the measures and mechanisms for implementing the Convention at the African level. UNEP assisted the INCD process in Africa working in cooperation with UNDP/UNSO, the Organization of African Unity (OAU), FAO, the Southern Africa Development Conference (SADC), the Intergovernmental Authority on Development (IGAD), the Arab Maghreb Union (UMA). UNEP continued to serve as the secretariat for the African Deserts and Arid Lands Committee (ADALCO), and a consultancy study was commissioned to consider how ADALCO could respond more effectively as the urgent action for Africa implementing arm. UNEP also helped launch the newly formed Regional Coordination Unit for Convention implementation in Africa.

UNEP also supported regional and subregional actions and networks in other regions: with the Economic and Social Commission for Asia and the Pacific (ESCAP), through the Desertification Control Research and Training Network for Asia and the Pacific (DESCONAP); with the Conference of Arab Ministers Responsible for Environment (CAMRE) and the Gulf Cooperation Council (GCC) in West Asia and within the FAO/UNEP joint desertification programme for the Latin America region. In the latter, advisory services were provided on the follow-up of existing national plans of action to combat desertification (NPACD) in Chile, Mexico and Peru and a regional symposium was held in Argentina for NPACD coordinators. UNEP continued to support Governments in developing and initiating national action programmes in Bolivia, the Republic of Kalmykia (Russian Federation), Turkmenistan and Kazakstan.

Under the International Programme for Arid Land Crops (IPALAC), UNEP, with FAO, UNESCO and UNDP, enabled individuals from African countries to travel for training in Israel on dryland germplasm collection and management.

UNEP assisted the International Food Policy Research Institute in preparing *A 2020 Vision for Food, Agriculture and the Environment* and participated with FAO in preparing the background document *Food Production and Environment Impact* for the World Food Summit.

UNEP participated in and supported major international conferences with a view to enhancing information exchange on scientific and technical aspects of dryland degradation and assist in the establishment of worldwide research networks to address knowledge gaps pertinent to desertification and its linkage with other environmental problems.

Within the framework of the Global Environment Facility (GEF), UNEP held a joint workshop between GEF partners and desertification experts to design GEF-eligible land degradation programmes, projects and guidelines for establishing their incremental costs and value for global biodiversity, climate change and international waters.

The year 1996 saw the conclusion of a three year-long preparatory process of two multi-line, multi-agency projects for submission to GEF: People, Land Management and Environmental Change (PLEC).

Social dimensions

UNEP continued its initiatives to document success stories in land management. The Saving the Drylands Award was instituted in 1995 and awarded to eight projects. In 1996, projects in India, Sudan and Ethiopia were evaluated and those in India and Sudan were deemed worthy of the award. In addition, a report was prepared analysing the indicators of success and lessons learned from the evaluation of projects for the 1995 awards.

A series of reports on social aspects of desertification were released, including those prepared for UNEP by UNRISD on

the linkages between dryland degradation and migration, and an annotated bibliography literature review of the social aspects of desertification. UNEP also produced reports on ongoing and recently completed land management projects including community participation, on gender studies in Pakistan and on replicable innovations in micro-level land-use projects in Kenya.

UNEP-UNDP-UNSO partnership activities

Assessment and awareness-raising were defined as the foci of joint activities under the 1995 UNEP/UNDP Partnership agreement. A joint programme was prepared to develop indicators for monitoring and assessment of desertification at national and local levels; assessment and monitoring of socio-economic impacts of desertification; and capacity-building in data and information management. A review of the desertification indicators proposed under chapter 12 of Agenda 21 was carried out at the request of the Commission on Sustainable Development.

Joint programme activities in awareness-raising focused especially on marking the World Day to Combat Desertification in cooperation with the Environment Liaison Centre International (ELCI). The day was marked in both 1995 and 1996 by workshops exploring the perceptions of young people on the drylands and of other actors on the Convention and national preparatory processes for action programmes on desertification.

UNEP, UNDP/UNSO and the interim secretariat of UNCCD have undertaken to draw together a coordinated awareness-raising programme to build on the ongoing programmes of organizations active in desertification control. This programme should forge new partnerships, highlight programme gaps, assist in fund-raising for a major global programme to raise awareness on the drylands, and catalyze resources for desertification control.

In addition, joint support to governments, subregional and regional organizations, especially in Africa, has continued to enable them to participate in the INCD process and in formulating national and regional action programmes. Close cooperation with the World Bank led, *inter alia*, to assistance with the development of the land-degradation component of the Aral Sea Programme and on the Steering Committee of the Middle East Desertification Initiative.

People, Land Management and Environmental Change

Introduction

People, Land Management and Environmental Change (PLEC) is an international collaborative research and capacity building programme, concerned with sustainable agrotechnology and the maintenance of biological diversity in small farm regions of the tropics and subtropics. It has been developed in response to demand from governments and local groups for models of biodiversity conservation within agricultural systems. The envisaged models will also be of significant importance for the conservation of biological diversity globally. The project has been developed over a period of three years through an extensive consultative process involving hundreds of stakeholders (and future partners for the implementation phase) at all levels in all project areas. PLEC an approximately eleven million dollar programme of which the Global Environment Facility (GEF) will finance about US$ 6.2 million, the balance comes from participating countries and institutions and from a group of other external donors. The United Nations Environment Programme (UNEP) is the GEF implementing Agency and the United Nations University (UNU), as the Executing Agency will coordinate the overall implementation of PLEC, while the scientific coordination of the programme is the responsibility of individuals in the Australian National University (ANU), the University of East Anglia and the New York Botanical Garden.The PLEC approach is to collaborate with farmers and local communities in identifying appropriate conservation approaches that are socially and financially sustainable. By integrating locally developed knowledge of soils, climate, and other physical factors with scientific assessments of their quality in relation to crop production, a set of sustainable agricultural technologies can be devised so that crop diversity and management diversity are maintained. There are existing management approaches which are based upon cultural and religious practices that promote crop and soil conservation, including recognition of the importance of resource rights and tenure, gender, livelihood strategies, and governance.

PLEC places particular stress on the diversity of farming practices over small areas (termed 'agrodiversity'), and on their responsiveness to changing societal conditions and adaptation to ecological conditions and variability. PLEC is also centrally concerned with societal forces, including population change, which create the conditions within which small farmers manage their land and biota.

PLEC views itself as an integrated 'core' programme, coordinating five country and regional projects, undertaking targeted, action-oriented research and institutional and human capacity building through its network. Through research and experiment, it also seeks the bases for sustainability in natural resource and ecosystem use. It will strengthen national abilities to manage biodiversity and degradation. The greater part of the

biodiversity conservation problem lies outside protected areas, in agricultural areas where crisis conditions have widely been generated by population growth, commercialization, deforestation, and land degradation. One of the most undervalued elements in the situation is the ability of a significant proportion of the world's smallholder farmers to modify their farming systems in a comparatively short period of time, often in ways that make sustainable use of biodiversity. While their object is production and not conservation, their objective of sustained production does call for conservationist methods, and many farmers have or acquire the knowledge to adopt such methods. PLEC draws information principally from what farmers do and know, and from the results of its own field research.

Project description and objectives

Overall goal

The overarching goal of the project is to provide strategic advice and recommendations for achieving world food security while protecting global biodiversity through the development of sustainable and participatory approaches to biodiversity conservation within agricultural systems. To reach this goal, the project engages local villagers and scientists in establishing demonstration sites in diverse types of ecosystems and areas of globally significant biodiversity, such as forests, mountain, semi-arid, freshwater, and wetlands in major regions in Africa, Asia and the Pacific, and the Americas.

Programme area

There are five programme 'clusters' which are the heart of PLEC and they are located in West Africa, East Africa, China, Papua New Guinea and Amazonia.

Project objectives

PLEC's first objective is to establish historical and baseline comparative information on agrodiversity at the landscape level in representative diverse regions. It is further to develop participatory and sustainable models of biodiversity management based on farmers technologies and knowledge, within agricultural systems at community and landscape level; and to recommend policies and approaches to sustainable agrodiversity management to key government decision makers, farmers, and field practitioners.

Envisaged outputs

By the end of the four years of project implementation PLEC will have produced tested models of on-farm participatory management of agrodiversity in different landscapes or ecosystems. The indicators of its progress are: (i) *In-situ* conservation of biodiversity in areas at risk due to agricultural production and population pressures using adaptive farmers practices and village participatory land use planning; (ii) Inventories of number and types of plant and animal species maintained per unit area; (iii)Descriptive and quantitative analysis of sustainability of farmers practices in relation to crop outputs and effects on biodiversity; as well as the proximate causes of trends of degradation; (iv) Scientific data and social analysis; and (v) Strong and sustainable community participation.

During the course of implementation PLEC will have established data on biodiversity, agrodiversity and degradation in vulnerable small farm environments, based on methodologies elaborated and tested in different landscapes and ecosystems. This data is to be made available to villagers, governments, regional scientists and the entire PLEC network. Through the collection and analysis of the above data PLEC will have made and communicated policy recommendations to government decision makers, extension workers, NGOs, and local groups. Through high level government participation in policy workshops and broad based participation of stakeholders in consultations PLEC will have identified key government decision makers and assessed their commitment to follow-up, and reviewed types and numbers of stakeholders involved. It will also have attained initial commitments of government officials prior to the start of field operations.

Planned activities

There are a number of activities PLEC will undertake to achieve its goal and to produce the envisaged outputs. They can be grouped as follows:

- Village outreach and experimental work, including gathering of scientific information by local farmers and scientists in identifying demonstration sites in countries;
- Scientific assessments of biodiversity in different landscapes;
- Participatory rural appraisal and social assessment in demonstration sites;
- Community outreach, experimental work, including collection and analysis of data and comparison of information across landscapes;
- Reports on models of participatory management of agrodiversity in different landscapes, where findings and recommendations are presented and disseminated to stakeholders, especially local groups, policy makers and NGOs;
- Capacity strengthening, including training and imparting skills to local scientists and village groups;
- Networking and dissemination of findings and recommendations;
- Coordination and planning of network activities;
- Monitoring and evaluation.

End note

PLEC will make an important contribution to the achievement of world food security while protecting global biodiversity through the development of sustainable and participatory approaches to biodiversity conservation within agricultural systems.

Progress News From Saving the Dryland Award-winning Success Stories

Compiled by:

Elizabeth Migongo-Bake,
Programme Officer , UNEP

Following UNEP-funded evaluation missions in 1994, eight projects received the 1995 Saving the Drylands Award (see *Desertification Control Bulletin No: 27*, 1995 for details of each project). They have recently been contacted for information on progress made since their evaluation by UNEP in 1994. Four of the eight have provided UNEP with this information which is summarized below.

Sonnleiten Ranch - Namibia

Current Status of the activity: the Sonnleiten Ranch activities that led to its getting chosen as a success story are on-going. Although going through another year of severe drought it is surviving with a reduced stocking rate which, when compared with other cattle ranches with the same conditions, is the highest in the country. Thus, it is still running effectively.

Adoption or replication of the initiative in the region: the project activities of Sonnleiten have been replicated on several commercial farms. However, the Centre for Holistic Resource Management (CHRM) has recently started a consultancy on communal lands in three different districts in Namibia (in cooperation with the German aid agency GTZ). Time will show how successful this approach will be.

Post evaluation: no post evaluation has been conducted, although the CHRM is continuing to monitor the Sonnleiten Ranch project.

Information provided by Secretary CHRM, Namibia.

PROBOVIL project Senegal (the award was won by Mr Serigne Samb's farm whose efforts were evaluated under the PROBOVIL project).

Mr. Serigne Samb, a pastoral farmer and member of one of the villages on which the UNSO sponsored PROBOVIL Project operated received a Global 500 as well as a Saving the Drylands Award in 1995.

Current project status: the results and experiences of PROBOVIL, whose managements activities ceased in December 1994, are currently being built upon by a new project to be funded by the International Fund for Agricultural Development (IFAD). The same applies to an Australian NGO, the International Foundation for Development, based in Louga, with which a special relationship is maintained in respect of the foundation's objective, in the development of village lands. The same can be said of the Thiès GERT-ENDA project and the Geography Department of St. Louis University, which repeatedly sends students to PROBOVIL for their final year dissertation reports. It is envisaged that all these structures will be able to adopt the results of the PROBOVIL project in the right context and finally incorporate them into the context of the administrative decentralization that is about to take place in respect of the rural communities of Senegal early this year.

Adoption and replication of activities: with regard to the lands that were managed by PROBOVIL, several activities are still on-going through the "Comités de Gestion du Terroir Villageois" that the project had helped to establish. Adoption and replication of Mr. Samb's successes are continuing. Besides its original purpose, this inter-village organization currently acts as the body for settling disputes. This somewhat surprising turn of events is such that it confirms the view previously held concerning the importance of village area organization. It should not be thought, however, that all the difficulties have been smoothed over or resolved. Some activities have come to an end and because of this the communities concerned have made some specific requests in regard to training.

Post evaluation: an ex-post evaluation of the whole PROBOVIL project has been made by the Office to Combat Desertification and Drought (UNSO). The evaluation was carried out in two phases: first, a participatory evaluation was made using MARP (Rapid Rural Appraisal) tools, this was followed by a second phase of external evaluation. Contact person for evaluation results: Ms. Lena Lindberg, SPO, UNSO/UNDP/New York.

Information provided by Mr. Abdoulaye Kane, Directeur des eaux, forêt, chasse et de la conservation des sols, BP 1831, Dakar, Senegal.

Tamarix project, China

Current status: by using past methods, the project is seeking further improvements and is expanding its coverage.

Replication/adoption of technique: the technique is being adopted in Dunhuang and Anxi in Ganshu province. Tamarix, an excellent choice for soil conservation, is being planted on the 235-300 mm-high edge of terraced fields in the yellow soil highland area. Some good results have been achieved. Tamarix, as a means to protect areas from erosion has been planted successfully on a trial basis in coastal areas in northern China. A plan is

Different strains of tamarix that have been introduced to the Taklamagan, desert

being drawn up to expand the area planted. In the past two years the implementers have selected different strains of Tamarix and used salt water for watering tamarix in the Daklamagan desert in an effort to reforest and stop drifting sands. This has been successful and the acreage covered is growing. In order to promote research on the use of Tamarix, a research paper on Tamarix was prepared and recently published in China by Professor Liu Mingtin.

Post Evaluation: this has not yet been carried out. Nevertheless, the project is viable because it has achieved visible economic, social and ecological benefits in a rather short time and has been widely accepted by the local rural communities.

Constraints encountered: some problems have been encountered in extending the technique, the main problem being lack of funds. According to the implementers, the availability of approximately US$ 60,000, would allow, through the use of summer floods, the rehabilitation of about 30,000 hectares of drifting sand and salinized soil, with tamarix. This would free 600,000 people in three countries from sandstorm damages, maintain agricultural production and ease the problem of fuelwood.

Information provided by Mr. Liu Mingtin, Head of the Tamarix Extension Team, Xinjiang Institute of Biology, Pedology and Desert Research, Urumqi, China.

Integrated whole farm whole landscape - " Payneham", Western Australia

Current status: this privately funded family commitment, evaluated by UNEP in 1994, has continued to develop the "Integrated Whole farm Plan" as finances have permitted. This development will continue as the Watkins' expect their son to continue with the integrated whole farm approach.

The dry season last year once again confirmed the Watkins' belief in the direction and worthiness of an integrated whole farm approach. The opening rains came very late (mid-June) and were constant. After a dry period within a month or after the rains waterlogging became very prevalent in the district. The water channelling and storage technologies developed on the farm controlled and channeled the water safely into the dams.

Replication/Adoption of approach: since the receipt of the two United Nations Awards (Saving the Drylands Award and Global 500 Award) the Land Management Society on the family's behalf is now promoting a farm visit programme. Some 300 visitors have signed the Watkins' visitors book since July 1995. Groups of farmers, government department personnel, educationalists and others have visited the project.

Ron Watkins continues to receive requests by fellow farmers for consultancy time. Currently he has approximately 40 farm plans that he has started and that are in varying stages of development with a further eight requests for initial visits to assess farms with a view to commencing an integrated whole farm plan.

Speaking engagements, approaches to governments and others in positions of influence continue to take up a fair proportion of Ron Watkins' time. The family was privileged to have the Governor of Western Australia and his wife visit the project in August last year. The Federal Minister for the Environment in Canberra, the capital city, is scheduled to visit the project in the near future.

Post evaluation: no post evaluation has been done since the Award was granted in 1995. However, the project was nominated and received two further Awards, one state, the other national.

The Watkins' have begun monitoring the farm using the newly released Land Management Society's Farm Monitoring Kit. This has been developed to help farmers measure the state of the health of their environment using 14 sustainability indicators. Bird counts continue to show an increased number of species now living on "Payneham".

Information provided by Mr. and Mrs Ron Watkins, "Payneham", Western Australia.

For more information on the above or to submit success stories for consideration for "Saving the Dryland" Award (details in DC Bulletin No: 28, 1996), write to:

Elizabeth Migongo-Bake
Programme Officer,
P.O. Box 30552,
Nairobi, Kenya
Success Stories Initiative
DEDC/PAC, UNEP
Fax: (254-2)623284
Email:
elizabeth.migongo-bake@unep.org

BOOK REVIEW

Problems of Arid Land Development

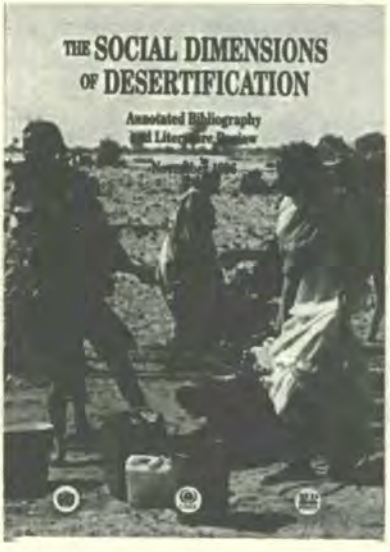
A. G. Babaev
Translated from the Russian
by Garson Leib, B.Sc.
Scientific Editor
Prof. M. Glyants

This book is the result of many years of research and writing devoted to the critical and urgent problems of developing the natural and economic potential of aridlands. Professor Agajan G. Babaev, D.Sc. (Geography) in the Director of the Institute of Deserts, member of the Turkmenistan Academy of Sciences, and member of many foreign academies. He is the Editor-in-Chief of the International journal, *Problems of Desert Development*. This book is the latest of his more than 300 scientific and popular science publications, including 12 monographs.

The author proposes to accelerate our understanding of the complex scientific basis for the development of aridlands. Special attention is given to the methods needed for the rational sustainable utilization of the natural resources of aridlands.

Considerable attention is also given to the development in the future of the fundamental direction for scientific research at local, national, regional and international levels. The author stresses the need to strengthen support for one of the earth's remaining frontiers of science: deserts.

This book will be of great interest to geographers, biologists, ecologists, agricultural specialists and resource planners who are concerned with environmental protection and utilization of natural resources. It will also be of interest to non-specialists concerned with the fate of aridlands around the globe.
282 pp.
Available from UNEP/DEDC/PAC



The Social Dimensions of Desertification Annotated Bibliography and Literature Review

The primary goal of this study is to provide a structured summary of information from various sources on the social dimensions of desertification in the form of an annotated bibliography and literature review. The key points are summarized and the main gaps and biases in the literature identified. The review concludes by revealing policy implications and suggesting future research priorities and appropriate measures that can be undertaken in collaboration with local people.

Structure and themes

This review analyses the social dimensions of desertification under six interrelated themes. Each chapter summarizes the key findings and lists the main references.

Chapter 1 - Social processes and desertification

This chapter is aimed at setting a broad, historical perspective of the external forces and social processes behind desertification in the different regions of the world. Global economic change, the monetization of local economies, population growth, urbanization, sedentarization and political marginalization are examples of some of the processes that have important impacts on social groups and livelihoods of people living in dryland areas.

Chapter 2 - Local demographic and social structures

Although risk and uncertainty are shared by all dryland populations, an enormous heterogeneity of social structures can be found. This diversity is also reflected in the wide range of livelihoods, living conditions and access to government services - from rural and urban, pastoralist to agriculturist, settled to nomadic, primary producer to wage earner. Certain groups such as refuges, the landless, indigenous peoples, pastoralists, children and migrants are particularly vulnerable to desertification. Women in dryland areas often suffer disproportionately as resources become scarcer.

Chapter 3 - Socio-cultural, economic and environmental impacts of desertification

This chapter highlights more location-specific examples of the socio-cultural, economic and environmental impacts of desertification on particular communities. Such impacts include the erosion of traditional, cultural and religious values;

restrictions on social mobility and changing migration patterns; worsening living conditions, and socio-economic decline as a result of commercialization and incorporation into the monetary economy.

Chapter 4 - Resource use conflicts

Clarifying land tenure and property relations governing resource use is of fundamental importance in dryland areas. Traditional institutions have evolved complex resource management and land use regulations but these are being broken down by external pressures. Issues of access, control, use and management of natural resources, and the differential impact of political marginalization on dryland social groups provide the focus of this chapter.

Chapter 5 - Local level adaptation practices

Dryland communities have evolved numerous coping strategies to deal with the risk and uncertainty of arid environments. This chapter outlines examples of both short-term and long-term adaptation practices in the face of environmental degradation. A distinction is made between those strategies used during "normal" seasonal changes, periodic crises such as droughts, and adjustment to government policies and development programmes.

Chapter 6 - Desertification policies and programmes

Both national governments and international organizations have implemented policies and programmes aimed at combating desertification, although there are few that have addressed the social dimensions directly. Some examples of success, failure and the main lessons learned from these experiences are outlined in this chapter.

The Second Edition of the World Atlas of Desertification

The first edition of the World Atlas of Desertification, produced in 1992 to coincide with the holding of UNCED in Rio de Janeiro, showed the then status of our understanding of desertification, its extent and possible solutions. Two thousand five hundred copies of the Atlas were sold and distributed all over the world. The readers were students and lecturers at universities and institutions of higher learning, research workers, government officials, policy and decision makers. The Atlas was described as "being by far the best illustrated source of information about the global extent and severity of desertification that has yet been published".

As the Atlas is now out of print and there remains a high demand for it, the need to update the first edition is pressing. Much more research and monitoring on desertification has been done since the first publication in 1992. Desertification is increasingly being recognized as a major economic, social, and environmental problem of concern to many countries. The production and dissemination of the second edition of the Atlas will support the implementation of the Convention to Combat Desertification (CCD), notably Article 16 which stipulates information collection, analysis and exchange to ensure better understanding and more systematic assessment and monitoring of the processes and effects of drought and desertification.

The second edition of the Atlas (available in October 1997) will highlight:

- The interlinkages between desertification and other global environmental issues such as climate change and biological diversity;
- Systematic information collection and data analysis pertinent to dryland degradation using digital databases;
- Socio-economic dimensions of desertification;
- Various success stories in combating desertification from the Dust Bowl to the current crisis of the Sahel.

Success Stories: Saving the Drylands 1995 Award Winners

The Saving the Drylands Awards were created by the United Nations Environment Programme in 1995 to recognize the outstanding achievements made by individuals, groups and governments in the global battle against land degradation.

The awards highlight the methods that have been effective at the grassroots level and the people who took the initiative to do something about the problem that puts at risk one billion people across the globe. As 40 per cent of the world's land area is under threat from desertification we want to applaud those who are doing something about this worldwide problem.

When we chose our "Desertification and Degradation and Control Success Stories" we wanted to see how the different projects had been integrated by local people into the local environment. Independent consultants looked at each of the projects and judged them on the basis of how successful they were biophysically, technically and socio-economically and on their sustainability. So the focus is on appropriate technology instead of high-technology,

on community empowerment instead of mega-projects.

We wanted to recognize projects whose methods could be replicated in other parts of the world. But each project is unique, and reflects the specific environmental, political and social conditions of its location. Nevertheless, each share some similarities in their emphasis on simple solutions based on local action, integrating people into the effort to reclaim the land. And each of the success stories clearly show that the effort is worth it: increased profits for local communities, a more stable and supportive environment, and the hope for a brighter future. Desertification is land-degradation, a problem made worse when we do not protect our arable and pasture land. Some of these stories are about sand dunes, but the focus is on the arable land that is affected. The threat does not only come from the desert but from bad land management. Deserts are a separate ecosystem, fragile environments that support life in unique forms. Degraded drylands were once highly productive and resilient ecosystems, now they have life crushed out of them.

By presenting the Saving the Drylands Awards and through related educational initiatives such as this pamphlet, we hope to raise people's awareness about some of the solutions to desertification. If one person feels inspired by these success stories to begin their own effort to reclaim the drylands - the so called "bright edges of the earth" - then this booklet will have accomplished its goal. And in future years we hope to honor the success of that person's work as we honor the eight projects in the pages that follow.

Our Planet

Volume 8 Number 5, 1997

The UNEP magazine for environmentally sustainable development

Our Planet, UNEP's bi-monthly magazine for sustainable development, is written for the general public and aims to explain environmental and development issues in a reader-friendly and accessible format. Each issue is dedicated to a specific theme (biodiversity, coastal ecosystems, ozone, etc) and includes news and information from each of UNEP's regional offices throughout the world.

If you wish to receive our Planet on a regular basis and are not currently on the mailing list, please contact

Ms Mani Kebede
Circulation Manager
Our Planet
UNEP
P O Box 30552
Nairobi,Kenya
Fax: (254 2) 623396
E-mail:
manyahleshal.kebede@unep.org
Specify your language preference.

NEWS OF INTEREST

ICARDA[1] NEWS

Better shrubs for range restoration

Desertification is a menace in semi-arid and and Mediterranean zones. Its causes are complex, but it is generally the result of the combined assault of climatic variability, and demographic human and animal pressure-including overgrazing. These have led to considerable damage to rangeland soil, water and feed resources.

ICARDA and Tunisia have just held a meeting of experts from 24 countries to discuss one weapon in their war against desertification-shrubs. And the meeting was not just for scientists; it involved farmers from nine countries, and NGOs from four.

Native or exotic shrubs could play an important role in rehabilitation programmes of marginal lands and rangelands in these zones, not only as a feed and fuel reserves but also in soil and water conservation in environmentally-degraded areas. But, as with any technology, it is important to exchange experiences so that problems are not solved twice, or unnecessary research camed out. To this end, the Pasture, Forage and Livestock Program of ICARDA and the Tunisian Ministry of Agriculture have just held the *Regional Training Workshop on Native and Exotic Fodder Shrubs in Arid and Semi-Arid Zones*, at Hammamet, Tunisia, from 27 October-2 November 1996. Other organizations also assisted (see footnote).

One of the farmers attending was Mr. Faysal Al-Ahmad Ibn Nuri, who is also head of the Jub Ahmad Almsha'el Cooperative for Sheep Breeding and Range Amelioration, in Aleppo Province, Northwest Syria. "I own 1,100 sheep," he said before the meeting. "My extended family had traditional control of 40,000 hectares in the low-rainfall area [below 200 mm mean rainfall], for grazing and for some barley cultivation prior to 1994/1995, when the latter was prohibited."

He described how Government shrub plantations had been established on a total of 14,300 hectares of the family's land. Shrub plantations to provide feed during lean times, when sheep are hungry and the vegetation is vulnerable, are an important part of Syria's rangeland strategy. ICARDA is collaborating in this.

"In April 1995, 1 leased 900 hectares for one month of grazing in the government plantation at Maragha. It was a dry year and grazing inside the plantation was good at first; milk production increased. Towards the end of the month, however, milk production fell back as the green grasses tumed yellow.

Because of the salty soils in the plantation area, I had to offer one meal of fodder to the sheep every day and double the normal amount of water-each sheep drank 11 litres per day." However, he is in favour of shrubs as a possible solution to desertification. "I think good rangelands should be managed better, and all shrub-cutting prohibited. Poor rangelands, which have been denuded of vegetation or have salty soils, could be the targets of shrub plantations."

Another farmer was Mr. Rob Von Holdt, from the Karoo region of the Republic of South Africa. He is also an active member of Somerset East Farmer's Association and Organised Agriculture. The role of this organization is to promote economic fodder-shrub establishment and management. Rob Van Holdt focused his presentation to the workshop on on-going efforts to the reduce cost of planting *Atriplex* plantations and maximize the establishment rate. Mechanization over the last 25 years, he reported, meant that handling of seed had been achieved at an acceptable cost. And he has developed a simpler, cheaper method to establish fodder shrub plantations by direct drilling of dehusked and pelleted seeds.

Participants from Jordan, Morocco, Pakistan, the Syrian Arab Republic, and Tunisia also gave presentations on their experiences with shrubs. In these countries, intensive efforts are being deployed to introduce fodder shrubs on a commercial scale. Revegetation of denuded areas, filling seasonal feed-gaps, and strategic reserves for drought management are examples of the various roles fodder shrubs play. But there is a clear need for more research on the management and use of fodder shrub species.

International experience on fodder shrubs was discussed during the morning session of the second day. Presentations were made summarizing the experiences from five parts of the world: the West Asia and North Affica (WANA) region; Southern Europe; the Republic of South Africa; South America; and Australia. The whole group then left on a two-day field trip to central and southern Tunisia, hosted by the Tunisian authorities.

A total of 113 participants from 24 countries attended the workshop.

ICARDA
P. O. Box 5466, Aleppo, Syria
Fax: +963-21 213490, 225105, 551860.
Tel.: +963-21 213477, 225012, 225112.
Email: ICARDA@CGNET.COM

[1] **What is ICARDA?** ICARDA, the International Centre for Agricultural Research in the Dry Areas, was established in 1977 to conduct research on the principal food crops of West Asia and North Africa. As one of the 16 centers under the umbrella of the Consultative Group on International Agricultural Research (CGIAR), ICARDA holds the global responsibility for research on barley, faba bean and lentil, and the regional responsibility for chickpea, wheat and pasture and forage crops. ICARDA also conducts research on livestock nutrition and maintains a special programme focussing on farm resource management.

AGROENVIRON, 98

International Symposium on Agro-environmental Issues and Future Strategies: Towards the 21st Century

MAY 25 - 30, 1998

Faculty of Agricultural Engineering and Technology

University of Agriculture, Faisalabad, Pakistan

Intensive agriculture, deforestation, waterlogging, salinity, industrialization and the population explosion have introduced changes that are threatening life on the globe. To counter such development, awareness campaigns, extension programmes, legislation and research studies are being planned/ executed. Both public and private agencies are involved. However, there appears to be a gap between word and action as many programmes lack cohesiveness. There is a need for the world community to discuss agro-environmental problems and suggest strategies for a better future. In view of this, the following topics related to agro-environmental issues are proposed for possible presentation at the symposium.

A Agro-chemicals and groundwater contamination
B Agricultural machinery related noise pollution, soil compaction, erosion etc
C Agro-industrial pollution and control
D Acid rain and air pollution
E Agro-environmental impact assessment and legislation
F Industrial/sewage irrigation and soil pollution
G Modeling agro-environmental systems
H Farm wastes, recycling and energy generation
I Mountainous deforestation and management
J Any other

Paper abstract due on:
15 November, 1997

Contact for further information:
Prof. Dr. Jehangir Khan Sial,
Symposium Director,
Faculty of Agricultural Engineering & Technology,
University of Agriculture, Faisalabad, Pakistan
Tel: 0092 (41) 30281-89 / Ext. 434
Fax: 0092 (41) 33214/647846/30679
E-mail: iqrar@ptccuaf.fsd.brain.net.pk
(Att: J. K. Sial)

Request for Articles and Photographs

The editorial board of the Desertification Control Bulletin is seeking photographs and articles for publication in the magazine. In particular, the editorial board is interested in receiving articles describing success stories in controlling dryland degradation and desertification, follow-up in the implementation of the United Nations Convention to Combat Desertification and NGO activities in the field of desertification control in all regions of the world, particularly Africa.

The technical advisor is also seeking photographic submissions for use on the cover of the Desertification control Bulletin. Photographs should be colour transparencies of subjects related to desertification, land degradation, humans, animals, structure affected by desertification, reclamation of degraded lands, etc. Please include a brief caption giving a description of the subject, place and country name, date of photograph and name of the photographer.

All contributions should be sent to:

Mr Leonid Kroumkatchev
Technical Advisor
Desertification Control Bulletin
UNEP DEDC/PAC
P O Box 30552
Nairobi
Kenya
Tel: 254-2-623266
Fax: 254-2-215615/623284
Email:
Leonid.Kroumkatchev@unep.org.

For information regarding manuscripts preparation, please see page ii of this issue of the *Desertification* Control Bulletin.

Desertification is land degradation in arid, semi-arid, and dry sub-humid areas resulting from various factors, including climatic variations and human activities. This latest, internationally negotiated definition of **desertification** was adapted by the United Nations Conference on Environment and Development (UNCED), Rio de Janeiro, Brazil, in June 1992.

The United Nations Convention to Combat Desertification was formally adopted on 17 June 1994 and opened for signature in Paris on 14 October 1994. This Convention is notable for its innovative approach in recognizing the physical, biological and socio-economic aspects of desertification; the importance of redirecting technology transfer so that it is demand driven; and the involvement of local populations in the development of national action programmes. The Convention has 115 signatories and came into force on 26 December 1996.

Desertification Control Bulletin
United Nations Environment Programme