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Desertification Control Bulletin

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Number 24, 1994

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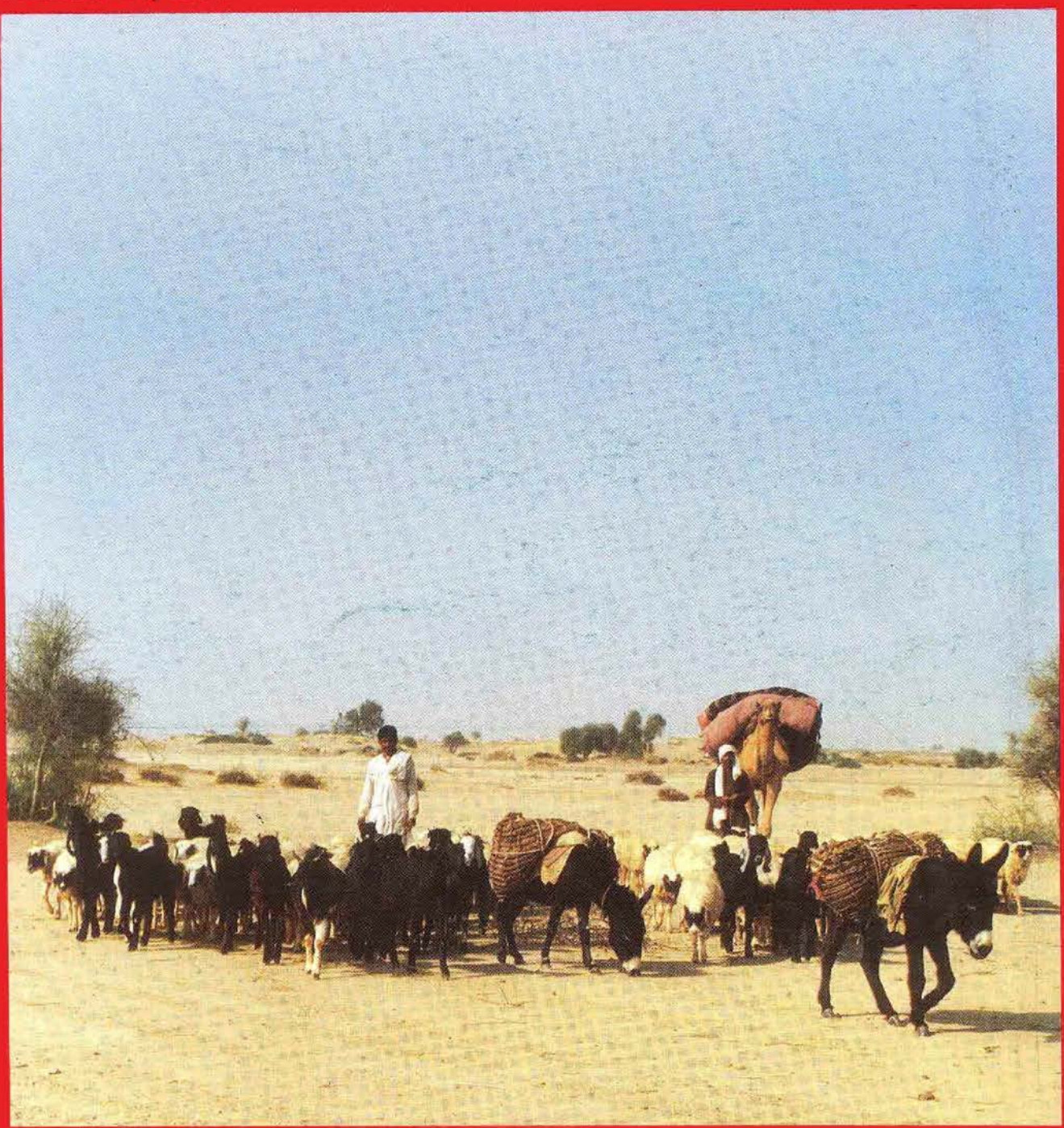

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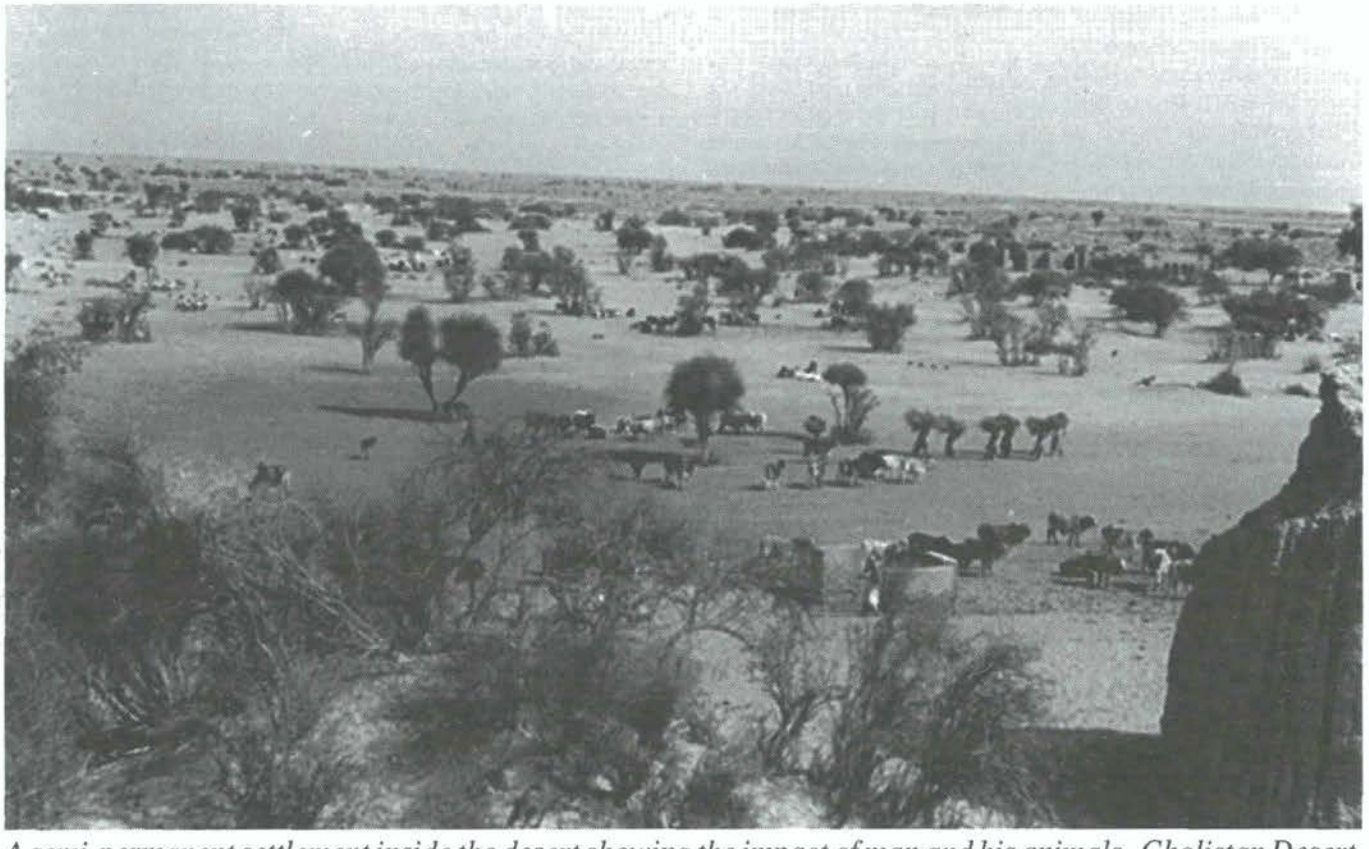

A semi-permanent settlement inside the desert showing the impact of man and his animals. Cholistan Desert, Pakistan. Photo: M. Arshad.

Cover: Exodus of Nomads during times of drought in the Cholistan Desert, Pakistan. Photo: M. Arshad.

The United Nations Conference on Desertification (UNCOD) was held in Nairobi from 29 August to 9 September 1977. This was the first worldwide effort initiated to consider the global problem and responsibilities posed by the spreading menace of desertification. Ninety-five States, 50 United Nations offices and bodies, 8 intergovernmental organisations and 65 non-governmental organisations participated. The United Nations Conference on Desertification prepared and adopted a worldwide Plan of Action to Combat Desertification (PACD) with 28 specific recommendations. The PACD was approved by the United Nations General Assembly at its 27th session on 19 December 1977.

Recommendation 23 of the PACD invited all relevant United Nations bodies to support, in their respective fields, international action to combat desertification and to make appropriate provisions and allocations in their programmes. Recommendation 27 gave the responsibility for following up and coordinating the implementation of the PACD to the United Nations Environment Programme (UNEP) with its Governing Council (GC) and Administrative Committee on Coordination (ACC).

Immediately after approval of the PACD, the Desertification Unit was established within UNEP to assist the Executive Director and ACC in carrying out their tasks to implement it.

In 1985 the Desertification Control Programme Activity Centre (DC/PAC) was created on the basis of the Desertification Unit by UNEP's Executive Director with approval from the Governing Council. DC/PAC is a semi-autonomous office with increased flexibility to respond to the demands of following up and implementing the PACD.

One of the main functions required by the PACD from the Desertification Unit is to prepare, compile, edit and publish at six-monthly intervals a bulletin to disseminate information on, and knowledge of, desertification problems and to present news on the programmes, activities and achievements in the implementation of the PACD around the world. Articles published in *Desertification Control Bulletin* do not imply 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.

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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.

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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. 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. Dia-positive 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.

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TheWorkshop "Listening to the People: Social Aspects of Dryland Management" [1]

Nairobi, 14 to 17 December 1993

[1] This Report was compiled from the Proceedings published by the International Institute for Sustainable Development (IISD)

Summary

The United Nations Environment Programme (UNEP) hosted an international workshop, "Listening to the People: Social Aspects of Dryland Management", in Nairobi, Kenya from 14 to 17 December 1993 that brought together nearly 100 social scientists, government and non-governmental representatives, and United Nations staff. The specific objectives of the workshop were: to find ways of implementing relevant recommendations in Agenda 21 involving social aspects of dryland management; to give programme guidance to institutions, including UNEP's Desertification Control Programme Activity Centre (DC/PAC) dealing with dryland management; and to provide inputs into both the Commission on Sustainable Development (CSD) and the Intergovernmental Negotiating Committee for the Elaboration of a Convention to Combat Desertification (INCD).

The participants met in working groups and plenary sessions through the week,to exchange research and views. Presentations were made on: traditional and Western natural resource management techniques; participatory approaches to research, project planning and management; land tenure and common property resources issues; gender issues in dryland management; donor activity; government policies; and environmental refugees. The common themes that emerged from these sessions were incorporated by the participants into a set of recommendations that included strategies to combat desertification and follow-up actions to the workshop. These were debated and agreed to by the participants at the end of the meeting.

A common theme throughout the workshop was that meaningful strategies to address land degradation have to result in fundamental changes to power relations between the various actors at international, national and local levels. In particular, effective communication channels are needed to enable affected communities in drought prone areas to express their needs and development priorities. Such channels would enable communities to negotiate with representatives of other groups and governments whose interests and activities affect their lives.

Governments were urged to create an enabling environment for true bottom-up development through stressing a popularly based development strategy. Suggested actions included a review of inappropriate policies and legislation and the creation of conducive market conditions. Participants called for reform in land tenure rights to be based on protection of existing systems of ownership, with guaranteed security of access to land to encourage the proper management of resources.

The group noted that a prerequisite to the planning of any intervention in a local community area is to recognize existing indigenous knowledge and management institutions and structures, including knowledge of production, consumption and marketing. In particular, governments and the international community should support efforts by local communities to develop environmentally sustainable marketing systems for renewable natural products from dryland areas to counter exploitative activities tending to degrade them. On gender issues, participants stressed that mechanisms for promoting women's equal participation in the decision-making process should be supported and their productivity and independent income generating capacity strengthened.

In a series of follow-up recommendations, the workshop participants suggested that: UNEP seek partnerships with governments, NGOs and international donors to carry out the group's conclusions; and that NGOs and social scientists, with donor support, help to sensitize "developers" to the socio-cultural factors of natural resource management.

Opening Plenary Session

The opening plenary session of the workshop, "Listening to the People: Social Aspects of Dryland Management", was convened by Mr. W. Franklin G. Cardy, UNEP Deputy Assistant Executive Director and Director of the DC/PAC. The first speaker was UNEP Executive Direc-

tor, Ms. Elizabeth Dowdeswell, who said that suggestions from the workshop would form valuable input for the CSD at its 1995 session and to the INCD. The recommendations must focus on how practical actions for sustainable development can implement changes that are both incremental and self-enforcing, given the approach of "listening to the people". She pointed out that past failures of various dryland management schemes are a result of a top-down approach, ignorance of local systems and lack of relevance of successes in the laboratory. She hoped the workshop would help address: how past success cases could be replicated; what enabling mechanisms could increase people's participation; the integration of socio-economic information at the ground level; the maintenance of effective two-way communication; and how benefits of dryland management reach those affected. She raised the issue of neglect of women and factors that make them vulnerable, and mentioned other social manifestations of desertification.

In his opening statement, Mr. Franklin Cardy stated that the causes of land degradation are mostly human, but are exacerbated by climatic fluctuations. Desertification has global consequences and is now on the global political agenda. Resources have been spent on treating the consequences of land degradation rather than the causes. The issue for the workshop is to describe how the social dimensions of desertification can be recognized and taken into account in the design and execution of all interventions to assist the people affected the most. Experience has shown that local-level action plans have generally been the most effective although failures have been caused by a lack of understanding of the importance and complexity of social, psychological and cultural factors to be considered in supporting change and programme design. Indicators need to be developed to enable monitoring in a social and cultural sense. Successful approaches include: involving local participation; appropriate technology transfer; local institutions and decision-making mechanisms; indigenous-based management methods; equitable relationships between men and women; and securing of land tenure and access to resources.

Opening Plenary Session. UNEP Executive Director, Ms. Elizabeth Dowdeswell (centre), Mr. W. Franklin G. Cardy (left), UNEP Deputy Assistant Executive Director and Director of DC/PAC and Mr. S. L. Barraclough, UNRISD. Photo: S. Shanthikumar, UNEP.

Mr. Cardy listed specific objectives of the workshop that include: identification of socio-cultural responses and adaptations resulting in sustainable management; proposal of socio-cultural approaches and mechanisms for optimal use of indigenous knowledge systems in land use management; recommendations to effectively integrate socio-economic information into programme and project planning; recommendations for the establishment of lines of communications with "bottom-up" information flow. Mr. Cardy stated that issues in Chapter 12 of Agenda 21 that must be dealt with in the social sphere include: monitoring, evaluation and information feedback to local communities; protection and sustainable use of non-degraded lands occupied by indigenous people; local involvement in land-use policy, research and transfer of technology; land-ownership, access to local resources and traditional management practices; and the involvement of land-owners; and consumption patterns. Mr. Cardy said that the purpose of the workshop was for the participants to focus attention on the numerous social issues involved in combating desertification with the objective of producing solid and practical recommendations for addressing these issues from a social and cultural perspective and to show how these can be incorporated in the work of development programmes. Cardy said that the underlying questions for this workshop are: what are the social and cultural considerations; how can they be incorporated in development programmes at all levels; what factors and steps must be taken to ensure sustainable development; and, how can all these be addressed in the Desertification Convention?

Mr. Ruben Vincent Mugo of the National Environment Secretariat of the Kenya Ministry of Environment and Natural Resources, noted that eighty per cent of the landmass in Kenya is dryland. He emphasized the need for local participation and public information and awareness to: enhance dryland management; strengthen the information base for planning; and facilitate the management of natural resources in diversification for poverty alleviation. Participatory Rural Appraisal (PRA) has been used successfully in village level programmes in Kenya. He highlighted the inadequacy of financial resources, and the need to find new and additional resources for dryland management and the alleviation of poverty.

Mr. Solon Barraclough, of the United Nations Research Institute for Social Development (UNRISD), spoke of the need to empower the people who are managing resources to make the right

decisions. Listening to the people is not easy since there are many voices from many groups with different opinions and perceptions. It is crucial to attack desertification or other problems with popular-based development strategies. Many people affected by land degradation have few options and we have to concentrate on what can be done locally and how people can be helped to organize and express their own perceptions of what they need and what can be done. The concept of desertification is ambiguous and this causes confusion in the donor community. Understanding the social relationships that are behind the degradation process is vital. One of the main conclusions of the UNRISD paper, "Social Dimensions of Desertification, A Review of Key Issues Emerging from the Literature," is that the main causes of desertification are outside the control of local communities. These causes include land alienation, the international market system and over-consumption and production. He concluded that these problems cannot be solved at the local level only.

Working Group Sessions

Three days were devoted to six working group sessions discussing the following themes:

1. Traditional and Western natural resource management techniques.
2. Beyond Farmer First: participatory approaches to research and project planning and management.
3. Land tenure and Common Property Resource issues.
4. Gender issues in dryland management.
5. Focus on donors.
6. Focus on governments.

Papers were presented in each session by experts in the respective fields. Each session prepared a report including provisional recommendations of what should be done to improve natural resource management in the drylands.

Bringing it All Into Focus

Mr.Robert Ryan, of the INCD Secretariat, gave an overview of the INCD process, which has produced a draft negotiating text of the Desertification Convention. As each region has unique characteristics, the global convention is a framework for regional annexes that will set out action programmes at different levels. The INCD has agreed to start implementing the Convention as soon as it is signed, in June 1994, rather than wait for the lengthy formal ratification process. Ryan further mentioned that the INCD has commissioned case studies to focus on the gaps and to furnish the INCD with crucial information on what is happening on the ground. The Desertification Convention is to be a legally binding framework, with the Conference of Parties ensuring a systematic follow-up. It is to take an integrated approach, with economic and social considerations taking an important place in the text. Focus will be on participatory action with decisions also made at the local level. There is a commitment to a single programme of sustainable development within countries. Although focus is at the community level, action will be taken at all levels to ensure "cascading enabling environments". Mr. Ryan noted that "listening to the people" also means that people should be able to relate to what is happening to them.

The emphasis of the Convention is to be on programmes rather than plans of action (unlike the PACD). Countries seeking assistance will have to facilitate action programmes following the model in the annexes of the Convention. These are to include action taken by NGOs and donor communities. Commitments to long-term programmes will reduce most of the conditionalities of conventional projects. The annexes will also set out coordinating measures for the action programmes. Assistance for scientific and technical cooperation will emphasize indigenous technology, information sharing, and a bottom-up approach.

Mr. Ryan told participants that while it is not possible to change the text of the Convention, practical recommendations from this workshop can have an impact on the action programmes in the annexes. For instance a description of various Participatory Rural Appraisal techniques that can be used on the ground would be an important contribution.

He asked the participants to come up with specific recommendations on: facilitation of local action; national government incentives to help local people; how to deal with inappropriate policies by ensuring international enabling environments and changing attitudes among policy makers and other actors so that the recommendations are implemented; and how to build and improve on the channels of interaction between local communities, taking into account national and global realities.

Workshop Recommendations

Desertification and environmental degradation are complex processes brought about by a varied mix of interactions between political, social, economic as well as natural factors at global, regional, international, national, and local levels. The outcome of these processes are highly varied and location specific. It is therefore impossible to devise general prescriptions to these highly complex problems.

Mounting evidence suggests that the introduction of development intervention itself has, at times, been a contributing factor in the various processes leading to desertification. Some of the major causes are: increasing pressures on land at the local level, the introduction of inappropriate development interventions such as top-down planning and implementation, inappropriate technology (for example large dams) and an overly optimistic drive of planners to enforce sedentarization of pastoralists, the impact of insecurity in land tenure, the local effects of structural adjustment programmes, and armed conflicts. Peace is an essential prerequisite for development, not only for the stability of government, but also to avoid wasteful expenditure on war which puts additional pressure on natural resources. Population pressure, large scale migration, and increasingly frequent droughts are also important factors. The widely acknowledged link between poverty and environmental degradation suggests that a fundamental element in good environmental management is the alleviation of poverty.

We affirm that any meaningful strategy to address these problems will have to result in fundamental changes in the power relationship between the various actors at international, national and local

levels. This is especially so for the most directly affected groups of people in drought prone areas. They will have to be given channels through which to express themselves and negotiate with representatives of other groups and governments whose interests and activities are having an impact on their livelihoods. Nothing short of radical changes will lead to effective solutions and lasting results. A massive redirection of the development effort away from a top-down directive to a democratic approach responsive to the specificity of local situations and needs is required. This should be an integrated approach that will balance conservation with local survival and social development needs, prioritizing local needs for sustainable livelihoods over national and national interests of various kinds. It must on a large scale promote the self-empowerment of local peoples, so that at all levels they have the right to participate in the decision-making process and express themselves freely and without fear. NGOs that work at the grassroots level and are accountable to the people are appropriate agents of change that can be used to make people aware of their rights and obligations.

From the background of our research and experience we acknowledge that many of the traditional practices, organizations, production, consumption- and marketing mechanisms, indigenous knowledge and strategies of local peoples for coping with environmental change have been highly sophisticated and adapted to local situations. However, many of these have been lost and broken down due to mounting pressures outside of local people's control. We advocate the preservation and -- wherever possible -- revival of these survival systems as the basis for locally adapted solutions to specific local food security problems and processes leading to desertification in general.

For effective strategies to combat desertification we provide the following recommendations:

A. Donor Agencies and International Bodies

1. Donors and international bodies should encourage and support efforts towards more effective interaction among all the actors in the development process.
2. There should be a change in emphasis from projects to programmes that are more popularly based, flexible and responsive.
3. International bodies should review their structure and procedures in the light of the principles of this document.

B. Government Policies

1. A prerequisite for any kind of sustainable development policy is a popularly based development strategy.
2. Trade, price, credit, social and economic policies should be evolved with participation by local communities (including indigenous peoples) and other sectors of society.
3. Governments should be encouraged to fully decentralize policy formulation and decision-making and streamline bureaucracy.
4. Government environment policies should be formulated in coordination ith all sectors and institutions concerned.
5. Local communities should be involved in deciding what national and international research and development programmes should be undertaken in teir areas, and in the environmental impact assessment procedures.
6. Governments should legitimzse the existence of community groups by guaranteeing them freedom and autonomy in the management of their natural resources and management programmes, and coordinate this process of legitimization with neighbouring countries to account for transboundary pastoral movements.
7. Governments should renew their efforts to eradicate illiteracy in rural areas, and ensure that environmental education is automatically included in the curriculum.

C. Land Tenure

1. The priority reform in regions where customary communal tenure systems are still in existence is for the state to recognize, through legislation, customary land rights and land tenure relationships.
2. Land reforms aimed at providing equitable access to land by those actually working it as well as providing them with secure, clear rights (and obligations) associated with their land tenure are essential, although not sufficient, for improving natural resource management.
3. The kinds of land reforms most appropriate for specific countries and situations have to be worked out locally, in consultation with all actors ensuring that women, mobile pastoral groups and other groups at risk are included in the process.
4. The international donor community has a role to play in exerting influence, by establishing criteria of conditionality where national governments are unwilling to accord local communities appropriate land tenure that promotes good land management.
5. Land clearing should not be a pre-condition of land tenure rights.
6. Land tenure policies should take into account the rights of access to grazing and water customarily exercised by livestock producers, which should be documented and officially recorded.

D. Participation

1. Realizing that there are diverse interests at the local level, marginalized groups should be supported by government and NGOs to organize themselves to represent their interests.
2. Local communities should be involved in information collection and should identify the problems that are most in need of research with priorities oriented towards finding solutions to natural resource management and food production problems.
3. Culturally appropriate participatory methods should be used at all stages of the development process to ensure that interaction between local people and development agencies is ongoing.
4. Local communities should be kept informed by their government about all projects, policies and programmes that will affect them.

5. Although participatory methods are recommended, care has to be taken that a full commitment is made to genuine participation by all sectors of the community.
6. Technological solutions derived from participatory research should be in line with the socio-economic, ecological and political contexts and management systems of the local communities concerned. Any such technologies must be economically sustainable and environmentally non-threatening.

E. Indigenous Knowledge Systems

1. A prerequisite to planning any intervention in a local community area is to understand and recognize indigenous knowledge and management institutions and structures. Opportunities should be provided for development workers in collaboration with local communities to learn methodologies for identifying and documenting indigenous knowledge.
2. An analysis and understanding must also be achieved of indigenous conceptions of existing systems of production, consumption and marketing.

These conceptions often include socio-cultural factors ignored or not noted by outside agents of the development process.

3. A community's perceptions and beliefs relating to the multiple processes that lead to environmental degradation need to be understood in order that effective plans are drawn up to counter any negative factors. Emerging out of indigenous and experts' knowledge regarding the problems and solutions, proper management techniques should be developed which protect biodiversity in different ecological zones.
4. Indigenous Knowledge studies need to be carried out by competent local people.
5. International agencies, governments, NGOs and local communities should carry out inventories of economic and natural resources based on IK of males and females of all ages and on scientific research. This information should be compiled in a data base, to be accessible and widely disseminated at all levels. Efforts should be made to make this information available in local languages as much as possible.
6. The resultant IK information should be incorporated in any formulation and implementation of programmes and project activities.
7. Incentives should be provided for farmers and pastoralists to conduct informal experiments: the formation of informal organizations of farmers and pastoralists should also be encouraged.

F. Biodiversity, Conservation and Sustainable Development

1. Special efforts need to be made to protect and enhance genetic diversity in wild plants and animals, livestock and domestic crops. It should be recognized that indigenous peoples' subsistence systems are often repositories of unique genetic variability.
2. It is recommended that technological diversity be promoted in order to deal with the biodiversity found in cultivars and plants found in the natural vegetation, and also local variability in soils and soil moisture conditions.
3. Development agents aiming to control land degradation in drylands should accept technological diversity as a strategic aim, recognise and support indigenous adaptive technological development, as well as searching for new or improved technologies.
4. The international community and governments should support efforts by local communities to develop environmentally sustainable marketing systems of renewable natural products from threatened dryland ecosystems to counter the prevalent exploitative activities that tend to degrade natural ecosystems.
5. Intellectual property rights relating to indigenous knowledge and technologies should be protected through the application of the relevant sections of theConvention on Biological Diversity.

G. Gender Issues

Equitable access to resources is a key element in the promotion of sustainable development. Despite this, the situation of many women in dryland areas is deteriorating, as their rights and access to productive resources is undermined and demands on their labour increase. Women have demonstrated considerable resourcefulness in adapting to the largely detrimental impact of these social, economic and environmental changes that are taking place in dryland areas.

1. Any strategy to improve and safeguard the local environment should build on the knowledge and resourcefulness of local women, and address their specific needs.
2. Governments should legislate to ensure that women have equal ownership rights when common property resources are privatised.
3. It should also be recognized that development thinking and practice are usually gender-biased and discriminate against women. Women should be enabled to participate fully throughout the planning process, and to set their own priorities. In addition, women should be recruited into extension and project management at all levels.
4. Gender-sensitive training should be provided to male and female staff at all levels.
5. Mechanisms for promoting women's equal participation in the decision-making process at all levels should be supported by strengthening existing women's groups and organizations, or where the need is expressed to assist with their formation.
6. Where women themselves identify the need, time spent on domestic labour should be reduced.
7. Women's productivity and independent income-generating capacity should be enhanced by supporting both traditional and alternative income-generating activities.
8. Efforts should be made to ensure that women retain control of their earnings by providing savings fa-

cilities specifically for women.

H. Environmental Refugees

1. States are urged to pay particular attention to the increasing stream of internal and cross-boundary displaced people who are being forced to move because of environmental reasons.
2. States are also urged to focus on mitigating the driving forces behind such displacements and to recognize coerced cross-border movements caused by environmental disruption or long-term degradation as a severe human problem.
3. Regional arrangements should be developed for protection of, and assistance to, such displaced people.
4. Affected countries should recognize that (a) risk of primary production failure is a distinctive part of dryland environments; and that (b) drought and land degradation, although sub-national in extent (in some countries) as a matter of international concern, justify an internal response, in particular to minimize population movements ('environmental refugees') between countries.
5. Countries in a position to provide assistance should recognize that the mitigation of unpredictable food crises in dryland areas of affected countries is a legitimate form of desertification control, as it (1) protects household capital for land-improving investments, and (2) minimizes disruptive population movements.
6. Affected countries' governments should aim to support and enhance the adaptive capabilities of smallholder production systems in drylands (e.g. crop diversification or rotation, indigenous trees and irrigation technologies in farming systems), and to minimize the disruptive effects of new technologies and systems on the capabilities.

I. Communications and Interaction

1. New social relationships and channels of communication need to be developed to facilitate not only participation by local communities in the development process, but interaction between local communities, NGOs, governments and donor agencies.
2. All actors involved in dryland and natural resource management should be equal partners, each with something to contribute and something to gain from successful interventions.

Recommendations for Follow-up Action

1. UNEP should consider establishing a small working group made up of social scientists and NGO representatives to advise on follow-up action that will be oriented towards implementing recommendations made at this workshop.
2. UNEP should consider initiating and coordinating a series of pilot projects and activities that would incorporate and demonstrate implementation of the various recommendations. These projects and activities should involve as much as possible participatory methods of problem identification, planning and implementation and aim to improve current methods of communication and interaction between local communities, NGOs, national governments and donor/technical assistance agencies.
3. If the above recommended follow-up steps are taken, UNEP should seek government, NGO and other international donor partners with whom to carry out the actions.
4. It should be recognized that the project formulation and planning phase is as important as the implementation of the activities. To carry out fully many of the recommendations contained in paragraphs A through I above a great deal of time may have to be spent in participatory approaches and the gathering of community-based information, including indigenous knowledge.
5. Recognizing that many government and donor agency personnel are not familiar with the socio-cultural factors affecting natural resource management and dryland degradation, it is recommended that appropriate NGOs and social scientists be encouraged to develop sensitisation and training programmes oriented towards improving socio-cultural understanding amongst personnel involved in the development process. Governments and donor agencies are encouraged to support these efforts and eventually make them part of standard requirements and procedures within their respective organizations.
6. More attention must be devoted to research on socio-economic aspects of dryland management: researchers and knowledgeable NGOs should make a concerted effort to de-mystify myths concerning pastoral and forager societies and economies through publications, workshops and interactions with development agents.
7. UNEP should encourage the development and dissemination of new and existing methodologies of participation and interaction.

Third Session of Intergovernmental Negotiating Committee on Drafting Convention to Combat Desertification

New York, 17 to 28 January 1994

[1] This Report was compiled from Special Issue of Earth Negotiations Bulletin published by the International Institute for Sustainable Development (IISD)

Summary of the Third Session

The third session of the Intergovernmental Negotiating Committee (INC) for the elaboration of an international convention to combat desertification in those countries experiencing serious drought and/or desertification, particularly in Africa met in New York from 17 to 29 January 1994. The UN General Assembly established the INC in 1992 to negotiate the international convention by June 1994.

At this session, the two working groups focused their attention on the draft negotiating text of the Convention prepared by the Secretariat and contained in document A/AC.241/15. By the conclusion of the two-week session, the working groups were able to complete at least one and sometimes two readings of each draft article. Although numerous brackets remain in the text, a great deal of progress has been made. The Convention has taken shape and the areas of convergence and divergence have been clearly identified. The INCD also began to discuss the regional instrument for Africa for the first time. After an initial discussion of the nature of this instrument and its relationship to the Convention as a whole, delegates requested the Secretariat to prepare a draft text for consideration at the next session of the Committee, which will be held from 21 to 31 March 1994 in Geneva.

A Brief History of the INCD

While the idea of a convention to combat desertification was discussed during the UNCED preparatory process, it was only in Rio where language was adopted requesting the General Assembly to establish an intergovernmental negotiating committee for the purpose of negotiating a convention. The General Assembly, during its 47th session in 1992, adopted resolution 47/188 calling for the establishment of the INCD and the convening of five sessions, with a view to finalizing the Convention by June 1994. The organizational session of the INCD was held in January 1993. At the meeting delegates elected Bo Kjellen (Sweden) Chair of the Committee, elected the Bureau, adopted the rules of procedure, set the schedule of meetings and established the working groups.

The first session of the INCD was held in Nairobi, Kenya from 24 May to 3 June 1993. The first week of this session focussed on the sharing of technical information and assessments on various aspects of drought and desertification. Divided into seven sections, the information sharing segment provided an opportunity for scientists, technical experts, delegates and NGOs to share relevant experiences and learn more about the scourge of desertification and its global dimensions. The second week focussed on the structure and elements to be contained in the Convention. Delegates also exchanged ideas about the Convention and its objectives.

Negotiations stalled in Nairobi over the elaboration of related regional instruments while still giving priority action to Africa. Kjellen proposed that an instrument on Africa, such as an annex, be negotiated once the main structure of the Convention had been defined and that similar instruments for other regions be negotiated subsequently. This proposal met with resistance from a few countries in regions other than Africa. They felt that their own problems with desertification deserved attention and that similar instruments for their regions should be negotiated simultaneously with the instrument for Africa. The decision on this matter was deferred.

The second session of the INCD met in Geneva from 13 to 24 September 1993. At this session, the Committee considered the compilation text of the Convention prepared by the Secretariat and agreed on the future programme of work of the Committee, including the elaboration of regional instruments from Africa, Asia and Latin America to supplement the Convention. As in Nairobi, the most difficult issue to resolve was the negotiation of regional instruments. At the con-

clusion of the second session of the INCD, the two working groups completed their discussion of the Secretariat's compilation text, identifying areas of convergence and divergence. There appeared to be consensus on a number of areas including the need for: a clear and concise preamble that refers to the history of desertification in the UN system; clear and concise objectives; and implementable commitments that are central to the Convention and articulated at different levels (local, regional and international). All delegates stressed the need for a public awareness strategy; improved education; and increased cooperation and coordination between North and South, South and South and among donors.

The 48th session of the UN General Assembly adopted a resolution submitted by the INCD that urged the Committee to successfully complete the negotiations by June 1994. The INCD shall hold one session after the adoption of the Convention during the interim period in order to review the situation pending its entry into force, in particular with regard to the implementation of provisions adapted to the specific needs of each region. This extra session should be held not later than 31 January 1995.

Report of the third session

The third session of the INCD opened on Monday, 17 January 1993 at UN Headquarters in New York. The Committee heard opening statements by Nitin Desai, Under-Secretary General for Policy Coordination and Sustainable Development, and UNDP Administrator Gus Speth. There were also statements by ministers from Mali, Tunisia, Kenya, Mauritania, Ambassador Ramtane Lamamra of Algeria, on behalf of the Group of 77, the Under-Secretary for the Organization of African Unity, and representatives from CILLS, the Federation of Swedish Farmers and the Kenya NGO, KENGO, on behalf of the NGOs. Without further ado, the Committee turned its attention to the main task of the session — the first reading of the negotiating text prepared by the Secretariat, as contained in document A/AC.241/15.

Elaboration of the Convention

Responsibility for elaborating the Convention has been given to the two working groups. Working Group I, chaired by Ahmed Djoghlaf (Algeria), is responsible for the sections of the Convention on the preamble; principles; objectives; structure and nature of commitments; national action programmes; regional action programmes; capacity building, education and public awareness; financial resources and mechanisms; and coordination and cooperation.

Working Group II, chaired by Anne de Lattre (France), is responsible for the sections on definitions; technology transfer and cooperation; research and development; information collection, analysis and exchange; institutions; procedures; final clauses; and the regional instruments.

Elaboration of the Regional Instrument for Africa

During the first two sessions of the Committee, regional instruments became a contentious issue since it appeared as if the priority given to Africa (as stipulated in UN General Assembly Resolution 47/188) implied that no regional instruments would be prepared for Latin America and Asia. But a new resolution by the UN General Assembly last year recognized that other regional instruments will be accepted, although the Committee must ensure that the African instrument is ready by June 1994. During the third session, INCD Executive-Secretary Arba Diallo presented a copy of the Secretariat's proposal for the contents of the regional instrument for Africa. The African Group also circulated a proposal "Implementation Annex for Africa" prepared by the Organization of African Unity (OAU) INCD Rev. 1.

Closing Session

The Plenary met for the third and final time at INCD-3 on Friday afternoon, 28 January 1994. Delegates adopted the draft provisional agenda for the fourth session (21-31 March 1994). The Committee also adopted the report of its third session, as contained in document A/AC.241/L.16 and the reports of the two working groups, documents A/AC.241/WG.I/L.2 and A/AC.241/WG.II/L.2.

A Brief Analysis of the Third Session of the INCD

The negotiation of a multilateral environmental agreement is by its very nature, not a speedy process. It can take years from the time an issue, such as desertification, first comes to the attention of the international community to the decision to negotiate an international treaty. For example, the INCD can trace its origins back to the 1977 Plan of Action — 15 years before the General Assembly adopted resolution 47/188, establishing the INCD. Once negotiations actually begin, it takes an average of 18 months before the treaty is adopted and opened for signature. Finally, it takes an average of 31 months before the treaty is ratified and enters into force. With this in mind, the 13 months of INCD negotiations as mandated by the General Assembly, represent a fairly short period of time. In fact, when compared to the examples of multilateral environmental negotiation, the INCD is actually making good progress.

The first phase of the INCD negotiating process took place at the first session in Nairobi during the information sharing segment. During this initial phase delegates identified the scope and magnitude of the problem, its primary causes and the type of international action required to address it. This phase also provided delegates with a shared body of knowledge. The second phase of the process began during the second week in Nairobi and continued through the Geneva session in September 1993. During this phase, the delegates explored various alternative proposals and attempted to reach some tentative, conditional understandings on some of the issues. This was also the phase where coalitions and groups started to coalesce as delegates started to determine shared priorities. During this phase, the INCD took one crucial decision — to request the

Secretariat to prepare the negotiating text. With this decision the INCD managed to circumvent the debate that characterizes so many other negotiations — the choice of text to be used as a basis for negotiation. As a result, delegates were able to spend more time on the actual substantive discussions at the third session.

In New York, the third phase, that of drafting, began. During this phase, delegates focused on the actual drafting and negotiation of the draft Desertification Convention. Delegates arrived in New York well-prepared and committed to the task of elaborating on the Convention. On some issues, delegates stopped making general statements and began to explore the positions of other regional and interest groups in an effort to achieve consensus. As a result, a great deal of progress was made during the first reading of the draft text with much greater clarity regarding the areas of convergence and divergence. It was also clear that delegates were committed to the bottom-up, demand-driven approach that had been agreed to in principle early on in the process. This involves consideration of local needs and problems with mechanisms that have been developed with the participation of affected populations.

Good progress, however, does not necessarily guarantee a strong, effective, action-oriented convention. Will delegates in their efforts to reach consensus, water down certain provisions to the point of uselessness? During the two-week bracketing exercise, there appeared to be greater focus on detailed drafting rather than attention paid to some of the larger, core issues that affect the entire Convention.

A fundamental issue relates to the relationship between the regional instruments and the Convention itself. In spite of the draft decision presented to the UN General Assembly last November, which provides time for the incorporation of other regional instruments into the Convention after the June 1994 deadline by scheduling an interim meeting to be held no later than January 1995, it is still unclear when these other regional instruments will be negotiated. The issues of timing and ensuring "priority" for Africa were still far from resolved at the end of INCD-3 in New York.

Scale-Dependent Mapping and Simulation of Landscape Dynamics in Arid Regions Prone to Desertification

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Abstract

The results of integrated landscape mapping at different scales (global, regional, local) are presented. The relationships between physical environment, land use and degree of landscape modification were studied for various arid regions.

Introduction

Environmental problems (including that of desertification) result from human activities and threaten the sustainability of global life-support systems. However, the information needed by decision-makers to address the situation is wholly inadequate. A realistic understanding of the trends and driving forces of global environmental change is needed to facilitate proper acquisition, dissemination and utilization of scientific knowledge about the nature and economics of different parts of the globe to ensure the establishment of priorities for action programmes. Environmental scientists must be joined by policymakers, resource managers, opinion-formers and the public at large to mobilise the intellectual and logistic resources needed to achieve this goal. Realistic understanding can only be achieved through landscape approach to the terrestrial environment as an amalgamation of hierarchically subordinated geosystems - present-day landscapes.

The representation and understanding of landscapes has been a topic of interest at least since the Renaissance. For a long time, the methods used by students of landscapes, notably landscape architects and geographers, were highly individual, developed through personal experience and often molded by idiosyncratic interests and values. Usually there was no serious attempt to determine whether these personal assessments were similar to other people's perception of landscape. Within the last two decades, however, there has been a broadening interest in and need for a more general standardization of landscape values. This concern has grown from such laws which call for the development of procedures which will ensure that previously unquantified environmental amenities and values will be given appropriate consideration in decision-making along with economic and technical considerations. The implementation of such a mandate requires environmental managers and policy makers to search for methods of landscape assessment that are explicit, able to stand up under public scrutiny and provide some measures to compare against economic or technical parameters. This need has resulted in the broadening of the base of researchers in landscape assessment, to include such groups as public land managers, lawyers and ecologists.

Concept Development

Recent extensive scholarly work in the field of landscape ecology (e.g. Forman and Godron 1986; Zonneveld 1989; Forman 1990; Milanova and Kushlin 1991) has resulted in a number of fundamental concepts of landscape, or land unit, that are proving to be important for a variety of environmental assessment applications. "Land unit" is described as an ecologically homogeneous tract of land at the scale at issue. It provides a basis for studying topologic as well as chorologic landscape ecology relationships. Mapping of such units is done by simultane-

Keywords: landscape classification, landscape dynamics, arid regions, desertification mapping.

ously using characteristics of the most obvious (mappable) land attributes: landforms, soil and vegetation, including human alteration of these three (*Zonneveld 1989*). Homogeneity of land units means that, within the tract of land as a whole, gradients cannot be distinguished, as from wet to dry, or poor to rich. In reality there are always differences; the smaller the scale of the map (the larger the area in nature), the more internal differences occur in the mapping unit. But such a complex unit can still be referred to as homogeneous if the composing elements occur in a regular pattern. Thus, a land unit is a tangible set of internal as well as external relationships.

Other similar definitions also emphasize the study of a complex body, one part of which is studied by soil scientists, another by vegetation scientists and others by geomorphologists, biologists, human geographers, climatologists and hydrologists. Most commonly, land survey reports since the mid-1970s included the results of past and present human activity on soils and vegetation, but purely economic and social characteristics were not included in the concept of land.

To allow for an internally consistent and less eclectic definition of land cover units, a hierarchical understanding of seemingly independent land attributes is needed. This has been achieved through the concept of "present-day landscapes" developed at the Department of World Physical Geography and Geoecology at Moscow State University (*Milanova and Kushlin 1991*).

Present-day landscapes (PDLs) are specific units of land surface characterised by a structurally organised combination of natural and economic components whose close interaction gives birth to spatially distinct territorial systems in a dynamic equilibrium.

Any landscape system of any dimension is a complex ecological- economic supersystem, where two subsystems - natural and anthropogenic - coexist and interact within the boundaries of their comparatively stable natural basis. The present-day peculiarity of any landscape system is expressed in the character of the anthropogenic transformation of its natural pattern. The notion of "present-day landscapes" significantly deepens the notion of "land" accepted at the UNEP Ad-Hoc Consultation Meeting "Assessment of Global Desertification: Status and Methodologies" (Nairobi, February 1990) as an object of desertification studies.

The PDL approach stresses that the natural foundation of any specific landscape should be regarded as an indispensable basis for the economic activities carried out on it on a local and regional scale. Optimal environmental management can only be achieved if economic structures and processes fit these dynamic natural structures. Ignoring this local compatibility principle proves to be the major cause of most local and regional ecological problems. The PDL approach also emphasizes the elaborate definition and comprehensive consideration of the whole global hierarchy of existing landscape organization, an important consideration given the belief that sustainable use of the present-day geobiosphere can only be achieved by preserving the diverse mosaic of natural landscapes.

Methodology and Materials

The main precursors for landscape monitoring and assessment are the inventory and diagnosis of their status. Landscape inventory is based on their mapping at various scales. Three major scale levels can be obviously distinguished: global (1:60M to 1:5M), regional (1:2.5M to 1:500K) and local (1:300K and smaller).

A classical methodology in land study at any scale begins by observing the object of interest and looking for similarities and differences among specific examples. The only feasible method of preliminary comparison of land units is to view them synoptically from above (Troll 1950). So, the PDL and land unit concepts could only be created after the development of remote sensing techniques.

Obtaining information on land characteristics from remotely sensed data can be achieved in two basic ways (Skole 1992): in the first approach, areas are stratified into categories or classes and then ranges of values of biophysical characteristics are assigned to each of them; in the second approach, these characteristics are estimated either statistically or by direct inversion using the remotely sensed data.

The first of the two approaches was broadly used in the current study. Among the presently abundant satellite imagery of the Earth's surface, of special importance were Landsat-TM and Cosmos-1939 medium-resolution regional coverage images. Highly repetitive coarse-resolution images from the National Oceanic and Atmospheric Administration (NOAA) polar-orbiting satellites proved extremely helpful for intra-annual (phenological) classification. A variety of conventional data sources describing natural and socio-economic components of arid regions were used, as well as limited field observations for "ground truthing".

An important, scale-independent, element of the whole methodology is the computerized Geographical Information System (GIS) and database on the present-day landscapes that can only be used in conjunction with the specially developed "knowledge base" - a hierarchically organized matrix of landscape attributes and their "cause-effect" relationships (types of zonality, altitudinal spectra, temporal sequences, anthropogenic development trends etc.) that help to determine numerous dependent sets of characteristics from a few quasi-independent mapping variables (Land cover, relief, human modification). This attribute matrix was used for data analysis and mapping of present-day landscapes of arid regions at all three levels of study - global, regional, and local. Sample plots of the three independent "layers" of data for a global-scale map of present-day landscapes are displayed for the Aral Sea region in Central Asia *(Fig.1)*.

Scale-Dependent Applications

1. Global Level

The global level of mapping was realised in a global map of present-day landscapes, compiled at the scale of 1:15M by scientists of Moscow State University within the framework of the Commonwealth of Independent States (former USSR republics)/UNEP Project (*Milanova and Kushlin 1991*). The land surface has been classified into 39 types of landscapes for the plains and 29 types for the mountains.

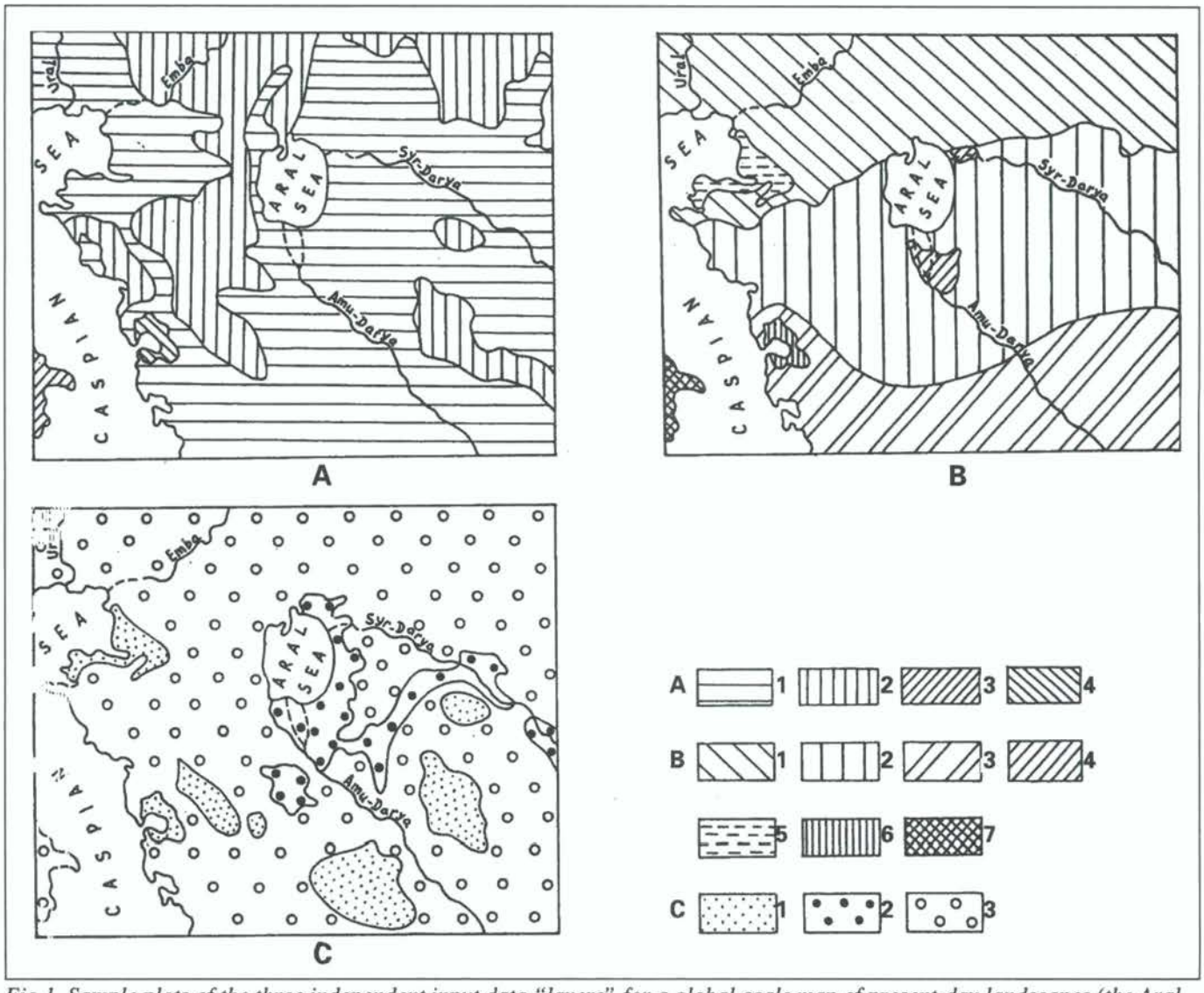

Fig.1. Sample plots of the three independent input data "layers" for a global-scale map of present-day landscapes (the Aral Sea region in Central Asia).

A. CLASS OF RELIEF: 1 - low plains, 2 - elevated plains, 3 - high mountains, 4 - plateaux.

B. ZONAL TYPE OF LANDSCAPE (OR ALTITUDINAL SPECTRUM): 1 - temperate semi-deserts and deserts (small shrub and shrub-grass on Haplic Xerosols *and* Yermosols*); 2 - temperate deserts (shrub and small shrub on Yermosols); 3 - subtropical semideserts and deserts (shrub-tree on sands and Haplic Yermosols); 4 - intrazonal riverine landscapes; 5 - intrazonal bog and marsh landscapes; 6 - intrazonal solonchaks; 7 - subtropical altitudinal spectrum of mixed hardwoods - coniferous forest - (alpine) meadow.*

C. DEGREE OF ANTHROPOGENIC MODIFICATION: 1 - modal landscapes; 2 -landscape-anthropogenic modifications; 3 - derivative (secondary) landscapes.

In terms of the degree of transformation, all present-day landscapes have been classified into two groups: modal (primary, or essentially unaffected) and natural-anthropogenic, the latter being further subdivided into derivative (or secondary) landscapes, landscape anthropogenic modifications and technogeneous complexes (*Fig.2*). The main idea for determining the degree of landscape transformation is to use the indicative features of the more sensible landscape components, like those of vegetation, as well as the extent and intensity of the current human impact. Vegetation is obviously a very dynamic and most easily detectible component of a landscape. It is widely used as an indicator of the spatial distribution of certain properties of the territory, such as climatic and soil differences; groundwater levels, migration paths and chemical composition. Commonly, it is the vegetation cover that is the first to be altered by human impact. This feature was used to develop a simple and reasonable approach to the definition

of the four major degrees of landscape transformation (*Fig.3*).

In this way, the mapping procedure of the current study implies four degrees of vegetation cover transformation. The first degree represents landscapes with practically no transformation of biotic components. The second is associated with the emergence of secondary biotic successions, while the third represents a high degree of alteration in the natural vegetation cover and the dominance of cultural vegetation. The forth transformation degree embraces areas where technogeneous structures almost totally replace the natural vegetation cover (e.g. in urban or mining).

Taking the above into consideration, specific goals of the global mapping of present-day landscapes can be defined as:

(1) to provide a quick reference and easily understandable presentation of the general geographic distribution of different stages of evolution of landscapes under human impact - from conditionally unaffected, or modal, landscapes through various anthropogenic modifications - as an aid to understanding how far the status and patterns of specific present-day landscapes are from their potential natural conditions;

(2 to show the current trends and tendencies of landscape evolution in each geographic zone or region (e.g. development of secondary savannas and shrublands in the place of tropical rain forests caused by clear-cutting, agriculturally-induced secondary steppe advancement in continental temperate forests, technogeneous tundra, degradation in the extreme polar environment);

(3) to help rapid identification of landscape areas with similar or analogous present status in order to locate precisely possible sample territories with a better or more advanced environmental management experience which can be applied in similar circumstances elsewhere;

(4) to reveal the territorial extent of areas with the most heavily transformed landscapes which may need prompt rehabilitation actions.

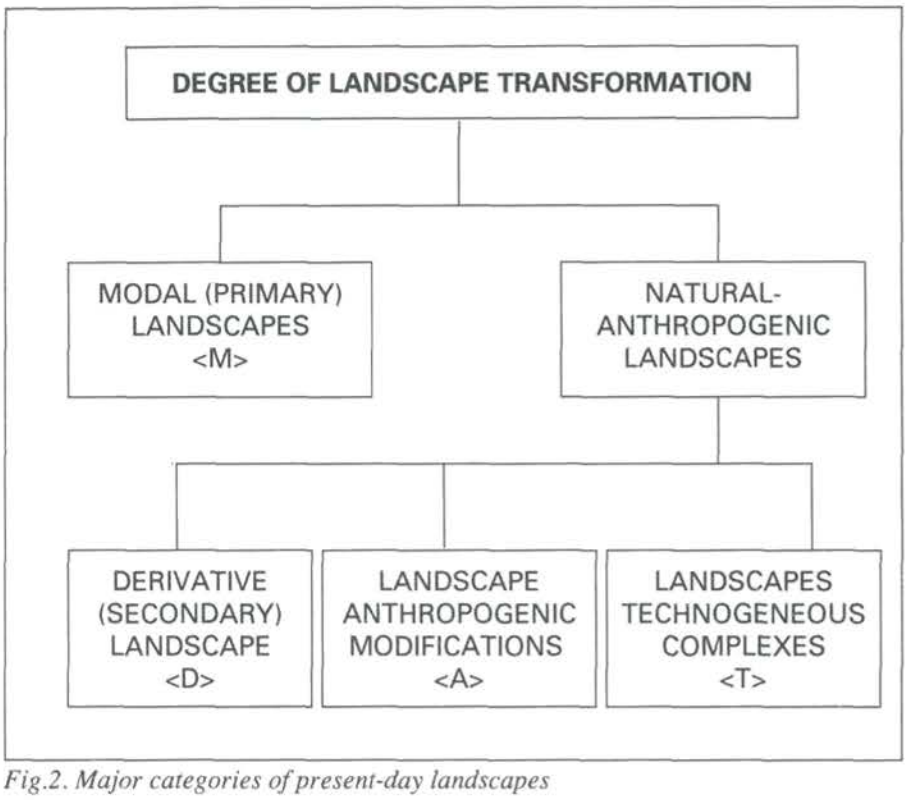

Fig.2. Major categories of present-day landscapes

DEGREE OF LANDSCAPE TRANSFORMATION

PRESENT-DAY LANDSCAPE CATEGORIES	VEGETATION COVER TRANSFORMATION	INTENSITY OF PRESENT-DAY HUMAN IMPACT
MODAL LANDSCAPES M	Practically no transformation	Low-intensive or virtually absent
DERIVATIVE LANDSCAPES D	Secondary biotic successions	Medium-intensive or territorially limited
LANDSCAPE ANTHROPOGENIC MODIFICATIONS A	Cultural vegetation cover	Dominantly high-intensive on >50 % of area
LANDSCAPE TECHNOGENEOUS COMPLEXES T	Replacement by technogeneous structures	Dominantly very high-intensive and technogeneous on >50 % of area

Fig.3. Degrees of transformation of present-day landscapes

The wall-chart format of the "World Map of Present Status of Landscapes" is designed to serve a variety of users. Its scale (1:15M) enables it to be used for both cognitive and practical purposes (*Fig.4*).

The map's cognitive value lies in the uniformity of the complex and diverse

environmental data that are systematically "folded" within the notion of present-day landscapes. This organization of environmental data can be further effectively exploited in developing more elaborate digitized spatial databases and/or GIS at different scales (both global and regional) and for different purposes of geoecological studies. Such an approach has already been tested by Moscow State University in a detailed inventory and diagnosis of the present status of landscapes at two regional-scale pilot areas in Asia and Africa - one in the Aral Sea region of Kazakhstan and Uzbekistan, and the other in Tunisia (see *UNEP 1992*).

The map has practical value in the domains of education, research, and decision-making.

Possible *educational* applications of the wall-chart include lecturing on environmental issues before the general public, and classroom seminars for college and university students in environment, technology, development and related disciplines.

Researchers in global ecology and environmental change (especially those involved in activities under the International Geosphere-Biosphere Programme, or IGBP) may find the map useful for developing a global land cover status GIS, for incorporating the map's unit boundaries as a basic land surface data overlay into global climatic models and into the global coarse-resolution satellite data sets, for further evaluating and cross-referencing quantitative information on anthropogenic processes in the environment.

Environmental *decision-making* can also be facilitated through the use of this map. By providing a quick worldwide reference and clearly visible presentation of the geographical distribution of different degrees of transformation of landscapes under human impact (including those critically transformed by specific activities), the map may serve as a handy tool for the establishment of regional priorities for various environmental action programmes.

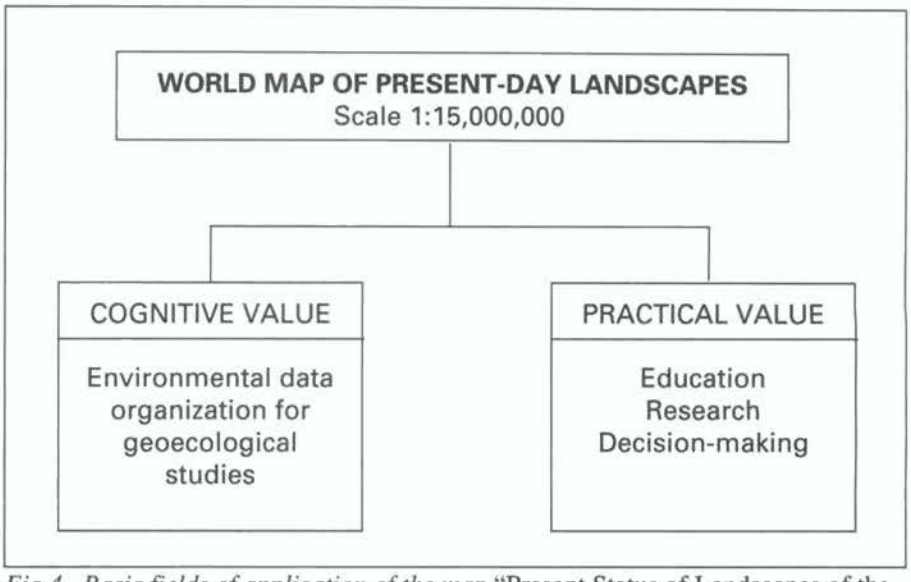

Fig.4. Basic fields of application of the map "Present Status of Landscapes of the World"

2. Regional Level

Investigation of landscapes at the regional level requires larger mapping scales. Such maps were compiled to the scale 1:1M, 1:2.5M for different arid regions prone to desertification (Iran, northwestern part of India, Middle Asian desert region of the former USSR). This level allows demonstration not only of types of zonal landscapes, but also of detailed characteristics of natural components, land use, modes of production, etc.

The description of the natural elements of landscape units are based upon characteristics such a relief, soils and vegetation cover. The present status of landscapes is characterised by four main alteration categories, as on the global map, but with more detail (*Milanova, Glushko, Ptichnikov 1992*).

Analysis of the map allows identification of landscape transformation in the process of their utilisation and the tracing of landscape evolution under the influence of desertification processes. The type and intensity of desertification processes which were assessed for each landscape unit is determined by the spatial landscape organisation as well as the history of their evolution. Each landscape unit has its own variety of degradation processes (both typical to the zonal landscape type and specific, induced by regional human activity). For example, for the Aral Sea region the following categories of degradation processes were assessed: drying of marine coast and delta-alluvial plains, changes in different landscape components such as relief, ground water, soil and vegetation cover.

Desertification processes in the Aral Sea region are related to the off-take of water from the Amu-Darya and the Syr-Darya rivers and the catastrophic drying of the Aral Sea, as well as overgrazing in the kyzylkum desert, situated to the south of the Aral Sea. The original map of present-day landscapes was produced for the Aral Sea region on the scale of 1:1M and was based on a variety of data sources, including remote sensing imagery, and field observations by the authors in the the kyzylkum desert.

3. Local Level

Local level landscape inventories requires large scale mapping. Such a map was compiled for the test Chardzhou Region of the Karakum desert, also situated in the Central Asia region of the CIS (Turkmenistan), where intensive human activities and utilisation of natural resources often bring about the disturbance of the ecological equilibrium which triggers desertification.

There are many desertification "halos" around desert wells inherited from the past. The appearance of new desertification spots can be caused by various factors (overgrazing, irrigation, technogenic pressure).

The test region is situated in the East Karakum desert and occupies more than half of its total area (14.7 thousand sq.km) in the southern part of the Turan Low-

lands, which are part of an ancient alluvial plain of the Amu-Darya river. The scale of landscape mapping (1:3OOK) has made it possible to show some qualitative as well as quantitative characteristics of landscapes, which were considered as pasture ecological-economic systems (PEES). The pattern of the PEES is first of all ranked according to the dominant type of grazing lands and their productivity measured by annual feed stock (AFS). More than 55 per cent of the test region is occupied by the haloxylon PEES (*Haloxylon persicum Bunge, H. ammodendron Bunge* and *Carex physodes*) with an AFS of 72-84 kg/ha. There are also PEES with *Calligonum arborescens Litv., C. caput medusae Schrene*, especially on the barkhan sand dunes, characterised by lower AFS of 56 kg/ha.

Further on, the types of PEES are ranked according to a grazing pressure coefficient (K), which was calculated for the 84 near-well grazing areas as the ratio between the "norm" (i.e. standard carrying capacity) and the real grazing area per livestock unit. Within the test region the areas of different grazing pressure have been distinguished according to the intervals of the above coefficient: slight (K less than O.6), moderate (K from O.6 to 1.3), severe (K more than 1.4) (Milanov 1991). It should be noted that the whole concept of establishing constant standards of carrying capacity has long proved to be irrelevant for arid pastures, since it ignores their inherent "patchiness" and temporal variability. But many countries like Turkmenistan still use such standards for agricultural planning purposes.

Each delineated present-day landscape unit has a unique symbol according to its natural and economic characteristics, which have been documented on a matrix table. The mapped information organized systematically according to the legend can be used as a first approximation to the precise diagnosis of the PEES status.

The methods of systems analysis and quantitative modeling were used to study PEES functioning. The model allows for the calculation of pasture productivity dynamics for 5, 10, 15 years. The model was realized in the Turbo C language and is working in the dialogue mode (Milanov 1991).

Six scenarios of landscape dynamics were selected for computer simulation, each of them with a different value of the main variable - livestock number: (1) conservation of the existing land use type in future; (2) establishment of reserve regime; (3) "normal" (official standard) type of grazing; (4) decreasing grazing pressure; (5) increasing grazing pressure; (6) strong increasing of grazing pressure.

The model includes two dataset inputs (primary and secondary productivity). Computer simulation showed that the optimal land use for the Chardzhou Region is to decrease grazing pressure and improve pasture. Capital expenditures for pasture improvement will be compensated in less than two years, with the economic benefit during this time increasing by a factor of two, assuming constant market conditions.

Conclusion

The mapping of landscape units allows for the possibility of comparison of different arid regions prone to desertification. The mapped analogies and contrasts of existing environmental management practices and their results may give strong impetus to the elaboration of scientifically grounded landscape-ecological planning and regional economic policies.

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Do Desert Reclamation Programmes Work? Lessons from Egypt

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Introduction

For nearly 25 years the World Food Programme (WFP) has supported an Egyptian Government programme involving the development and settlement of land reclaimed from desert areas east of the Nile delta. The experiences gained from this programme suggest some important lessons for desert reclamation projects generally.

Background

Egypt has a total area of slightly over one million square kilometres, but the arable area is mainly confined to a narrow strip of land along the Nile valley and the delta amounting to 36,000 square kilometres or 3.6 per cent of the total land surface. This limited area has to support a population estimated at about 54 million.

The situation is further aggravated by the rapid growth of population due to a high birth rate against a declining death rate. The population has nearly tripled since 1947. The increase in population, unaccompanied by a corresponding increase in the cultivated land area, has resulted in a serious deterioration of the already adverse land/person ratio. The per capita cultivated area has fallen from 0.48 feddans [2] in 1907 to less than 0.16.

Since 1970 Egypt has gone from being an exporter of agricultural produce to relying on more than $4 billion of food imports annually, some 40 per cent of its food requirements. Egypt is also the largest recipient of global food aid, receiving more than one tenth of all cereal food aid.

The Government's overall objective for the agricultural sector is to increase agricultural production to meet the needs of the growing population and to lessen dependence on food imports. This objective is expected to be achieved both by bringing additional land under cultivation through land reclamation and by increasing yields from land already under cultivation. It also attaches high priority to redistributing the population, which is heavily concentrated in the Nile valley and Nile delta, by constructing towns and villages in the "new" and less sparsely populated areas.

Thus, top priority is given to land reclamation, the economic justification for which is mainly based on the expected increases in agricultural production. However, social justifications are equally important: it is hoped that reclamation of land and land settlement will reduce population pressure in the urban areas and on "old lands", employment opportunities will be created and family incomes will be improved, especially for landless farmers and graduates. The land reclamation programme is also viewed as a means to combat desertification.

WFP has provided resources worth nearly $300 million in support of this massive programme. The experiences of the first phase of assistance was generally positive, encouraging further assistance to the reclamation and settlement programme. However, changes in many of the basic elements have resulted in an increasing number of problems with the WFP-assisted projects.

The Desert Reclamation Programme

Each of the Egyptian government's five year development plans included targets for land reclamation. Under the latest five

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2 1 feddan = 1.038 acres = 0.42 hectares.

year plan, for 1987/1988 to 1991/1992, approximately 750,000 feddans were to be reclaimed and brought under cultivation.

Of this total, 125,000 to 150,000 feddans (i.e. up to 25 per cent of the total) were earmarked for allocation to landless farmers and unemployed graduates, with the remainder to be purchased by private investors. The "smaller" private investors purchase the land from the Government at prices ranging from $86 to $173 per feddan depending on the location and the quality of the land, in areas which have not been reclaimed. The prices of reclaimed areas with irrigation infrastructure range between $862 to $1,724 per feddan. Larger plots of land are sold through auction.

The Government's investment strategy for land reclamation has increasingly shifted from the public to the private sector. The costs of land reclamation are at present mainly borne by the private sector. In the case of landless farmers and graduates who are allocated between five to six feddans each, only half of the land reclamation costs are recovered over a period of 33 to 34 years without interest.

Land is distributed to the settlers upon the completion of the reclamation phase and the establishment of essential economic and social infrastructure. These works are undertaken by public sector companies under the supervision of the General Authority for Rehabilitation Projects and Agricultural Development (GARPAD).

As newly reclaimed desert soils are deficient in nutrients and organic matter, the crops during the first year are generally very poor despite the application of chemical fertilizers. Normally these first crops are not harvested but are ploughed under as green manure. The organic matter in the soil is built up gradually by the addition of farm manure and further ploughing-under of crops as required by local soil conditions.

The early settlers benefitted from a high level of investment by the Government in land preparation. They also took up their lands during a period of heavy government subsidies on fertilizers. However, the ever increasing cost of land reclamation, especially on remote and inaccessible soils, and the fact that a large proportion of reclaimed lands were allocated to landless peasants and graduates at prices much lower than the actual reclamation and development costs, prompted the Government to change its approach so that it could recover more quickly at least part of its huge investment in land reclamation. By 1989, it was estimated that providing just the basic infrastructure, cement-lined canals to bring water from the Nile, pumping stations, drainage networks, roads, electricity, potable water and sanitation was costing $790 per feddan.

Thus, in the early 1990s the Government changed its policy of cultivating and improving newly reclaimed lands for long periods (ranging from 3 to 6 years, depending on soils and other conditions) before such lands were allocated to settlers. The new policy, in principle, was to shorten this period to only one year. There is general agreement that reclaimed soils (except for well drained sandy soils without salinity/alkalinity problems) require at least three years of development/cultivation before they reach the marginal level of productivity. (i.e. where the cash income from the crop exceeds the costs of production). Mechanized ploughing and soil preparation can help to speed up land preparation.

To assist the settlers during the land development phase, the Government now provides a cash subsidy of approximately $20 per month of the first year of settlement, as well as free seeds and fertilizer. However, the cash incentive provided by the Government to new settlers is nowhere near enough to cover the extra costs involved. Furthermore, with the lifting of government subsidies on fertilizers - as part of structural adjustment measures - the price of fertilizers has skyrocketed way above the reach of most new settlers. Settlers are therefore obliged to cultivate their lands for extended periods before the soil reaches a marginal level of productivity, needing food assistance over a longer period. As a result they have remained dependent on food aid to tide them over for longer and longer periods.

On the other hand, the large agricultural companies in general have coped far better with the problem of soil preparation, sowing and harvesting of crops on a large scale, in part because of their access to tractors and other mechanized equipment.

Government land tenure policy has also changed. During the earlier years of land settlement, settlers were granted probationary ownership to land. After 1964, policy favoured tenancy rather than ownership with rent reviews every three years. After the 1967 war, most of the reclaimed land was given on a tenancy basis. Later, the policy was changed again to give ownership to settlers after about a three year probationary period, during which time the settler paid a nominal rent. Once the settlers started paying the annual instalment, they became the owners of the land with the provision that they could not sell, rent, divide or mortgage the land to third parties until all instalments over the required period of time (20-30 years) had been paid.

The areas allocated to each settler (five feddans) are considered adequate to support one family unit (in fact, some 90 per cent of total farm holdings in Egypt are less than 5 feddans (Kishk, 1992)) but the next generation will need to look for employment opportunities elsewhere. The Government has tackled this in the past by giving priority to settling second generation farmers in other newly reclaimed areas.

The families of new settlers on reclaimed land receive WFP food aid for three to four years, in theory until their farms start producing enough to support them. Under the current phase of assistance, the beneficiaries buy food aid commodities at less than 25 per cent of their market value. Since a rural family spends up to 65 per cent of its income on food, the savings can be considerable. The sales revenues help fund community development activities such as support to village cooperatives, provision of livestock, training in improved animal husbandry, training for women and provision of improved housing.

Participants

The first phase of assistance mixed farmers who knew modern agricultural techniques in the same villages as inexperienced graduates and landless farmers. The latter usually had surplus labour to sell and practical experience to share, while the graduates were open to experi-

ments with new farming methods and helped improve overall literacy and hygiene in the settlements.

Currently, the settlers consist of two major groups, each comprising about half of the total: landless farmers and unemployed graduates of technical schools, colleges and universities.

The response of the two major groups of beneficiaries to the Government's land settlement policy in newly reclaimed areas has always far outstripped targets. For example, in one of the latest announcements inviting applications for settlement in the western delta, out of 170,000 graduates who applied, the settlement areas could only absorb about 5,000 applicants.

Some 95 per cent of landless farmers originate from the same governorate within which the project areas are located, facilitating their recourse to occasional cash loans and labour resources from their families, particularly during the initial years of settlement. A substantial number are second generation settlers. Nearly all (90 per cent) of the landless farmers are married; most of the rest arrive with their natal family. Less than three per cent are widowed with families. The rate of illiteracy is high (over 60 per cent) and income levels at settlement are very low, falling in the range of L.E. 50 to L.E. 100[3] for up to half of the families.

The unemployed graduates represent a mix of the technical qualifications needed in the new settlement communities, with preference accorded to agricultural specializations and rural backgrounds. In the absence of concrete opportunities for productive employment, these unemployed certificate or degree holders eventually would have swelled the ranks of redundant civil service employees under the long-standing policy of the Government to guarantee employment to all graduates and to act as employer of last resort. In contrast to landless farmers, the majority of male and female graduate settlers are single. Although most originate from rural areas or rural backgrounds, a number have also migrated to the settlement villages from Cairo or Alexandria. While most male and female graduates bring along their parents and/or siblings to the settlement villages to help meet labour requirements, they also resort to labour sharing within the settlement community and to hired labour, especially for land preparation, and occasionally for planting and harvesting.

The selection criteria applied to the two groups of beneficiaries differ primarily in relation to personal factors (age and marital status). For the graduates, for instance, an upper age limit is set at 30 years, compared to 50 years for landless farmers, and eligibility is extended to both single and married applicants; single landless farmers are ineligible unless they are heads of households. The direct benefits derived by all settler households in the short and medium term consist of the following:

i) Security of tenure on five to six feddans of newly reclaimed land under formal but provisional title deeds and at a minimal cost of $431 per feddan to be repaid after a three year grace period on the basis of annual instalments over a maximum of 30 years (at which time full legal title is conferred);
ii) A standard core house at a cost of $2,586 and on a repayment schedule of 30 years following a three-year grace period;
iii) Acash stipend of $233 a year for the first year only, to help cover initial labour costs or consumption requirements, as well as seeds and fertilizer valued at nearly $75 a feddan during the same year;
iv) A food aid basket, valued at $18.20 a month, to help cover basic subsistence requirements over the first four years;
v) Access to a range of essential economic and social investments directly financed from the project-generated counterpart fund, on a loan or grant basis, which are designed to help accelerate the integration of crop and animal production, diversify income sources, consolidate group cohesion and provide services through cooperatives and other associations in the new communities and help finance home improvements;
vi) Access to basic community services made available in the new settlement communities including schools, health care facilities, potable water supplies, electricity, consumer stores and markets.

Whereas graduates selected for settlement prior to 1986 were integrated with landless farmers in the same villages, the tendency in the more recent settlements is towards segregation by beneficiary category and even by gender; in one village, 90 per cent of settlers were female graduates. This is problematic from a social and economic point of view. In the integrated villages, there appears to have been an equitable interchange between both categories of beneficiaries in the face of constraints particular to each group. Graduates resorted to the formerly landless farmers for advice on traditional agricultural practices and for labour during the peak seasons. The formerly landless farmers were more responsive to adopting modern agronomic practices following the example of graduate farmers, and obtained additional household income as suppliers of family labour on the plots of graduate settlers. Moreover, the sense of community purpose and of group cohesion represented in the organization of social and cultural activities as well as community self-help schemes (such as building a mosque, or contributing to furnishing a day-care centre) developed at a more accelerated pace in integrated villages.

Access to markets

Producing goods is one thing. Being able to sell them is something else. The newly reclaimed lands are not close to the major established markets, and settlers find it difficult to obtain remunerative prices for their goods. More recent settlers have, for the most part ,avoided vegetable cultivation, which had proven profitable for older settled areas that were closer to urban markets. As well as having to cope with poor transport links, the settlers are at the

3 Egyptian Pounds. In 1989, when much of the data quoted in this paper were collected, the exchange rate was approximately $US 1 = L.E. 2.30.

mercy of transporters who charge high prices to take the produce to markets. The marketing of food in Egypt is tightly controlled by a small number of traders; the settlers have been unable to break this cartel. Morsy (1993) notes that researchers looking at the impact of structural adjustment have expressed concern about the future of small-scale farmers if market forces or government policy continue to increasingly favour larger productive units.

As a result, the settlers usually receive less than remunerative prices for their hard won produce. Often they only receive between one third and one-eighth of what the produce is sold for in the central markets of Cairo or Alexandria (Sayagues, 1991). Some crops, notably peanuts, are reported to have been ploughed under rather than being harvested, which would have involved further costs, and hence losses. A similar fate has been reported for peas.

The Government has not so far encouraged the formulation of producer cooperatives, the main hope the settlers would have of trying to break out of this situation. On the other hand, Morsy (1993) suggests that the development and expansion of new desert towns will eventually provide potential new markets for the settlers, as well as possible off-farm employment opportunities. Further thought also needs to be given to the products that are being marketed. For example, Morsy (1993) suggests that the marketing of dried flowers, easily prepared in the desert environment, might encounter less stiff competition than other products.

Crop	Cost/Feddan L.E.	Unit Price X yield L.E.	Net Income/Feddan L.E.
Corn	693	50 X 12 Ardab[1]=600	- 93
Sunflower	518	1 X 500 Kg = 500	- 18
Watermelons	1602	200 X 10 Ton = 200	397
Tomatoes	1526	200 X 8 Ton = 1600	74
Wheat	735	75 X 10 Ardab[1] = 750	15
Broad Beans	656	150 X 5 Ardab[1] = 750	94
Potatoes	1620	200 X 8 Tons = 1600	-20
Squash	114	400 X 3 Tons = 1200	86
Eggplant	1519	200 X 8 Tons = 1600	81
Peas	1065	350 X 3 Tons = 1050	- 15

1 Ardab varies according to the crop. One Ardab = 150 Kg. wheat or 155 Kg. broad beans. From Morsy, 1993.

Table 1: Costs and returns from different crops.

Income and Cash Expenditure

Most settlers have very little cash income. Average monthly income is in the order of L.E. 200 (from Morsy, 1993). Work among rural dwellers by Ibrahim, Kishk and El-Zanaty (1993) suggests that an average family expenditure of rural small-holders is in the order of L.E. 165 per month, not including the costs of agricultural inputs, which in the desert reclamation areas can range from L.E. 1600 Egyptian pounds per feddan for watermelons to L.E. 500 per feddan for sunflowers. Kishk (1992) estimates an average annual return of approximately L.E. 2,100 from 5 feddans. In fact, the net return per feddan can vary substantially depending on the crop grown, as shown by Table 1.

Along with Egyptian farmers generally, settlers have been affected by the rapidly rising prices for agricultural inputs, particularly pesticides and fertilizers. Settlers have also been severely affected by the withdrawal of subsidies for electricity, needed to pump the irrigation water. There have been fears that the estimated new cost of L.E. 400 per feddan per year will make farming uneconomic, and force many settlers to abandon their land, despite most settlers having no alternative means of livelihood (Morsy, 1993).

The problem of high input prices is further aggravated by limited sources of credit. Credit available from the settlers' cooperatives (funded from the money paid by the settlers for the food aid) is too limited to be of practical value, and anyway is mostly allocated to construct communal facilities. Most settlers have been unable to obtain loans from village banks because they lack acceptable collateral. Further, the high interest rate of 18 per cent charged by these banks is considered comparable to that paid for credit from crop merchants. In such cases interest of 10per cent is automatically deducted from the loan given by the merchant to the cultivator. In addition, the crop merchant has the right to the harvest at a 10 per cent discount.

In spite of the less than fair deal to the cultivator, settlers rationalize their dependence on merchants in light of their need not only for cash, but also for seeds and fertilizers which are obtainable from the merchants, although often at double the market price.

The absence of credit results in lower land productivity. Settlers reduce the amount of fertilizers or pesticides they use, or buy poorer quality seeds because they are cheaper.

In other parts of Egypt, off-farm employment provides a substantial portion of family income (Kishk, 1992, estimates roughly half of rural household income comes from non-farm employment). However, in the settlement areas, opportunities for off-farm employment are severely constrained because the areas are distant from other settled areas. The

landless farmers are in the best position to find other agricultural labour (either for other settlers or on the farms run by the large agricultural companies). Some settlers also supplement their incomes by offering services to other settlers or by manufacturing small handicrafts. The expansion of new cities might also provide additional off-farm employment opportunities.

Certainly there is general agreement that without WFP food aid the average settler would be unable to balance his budget. Food aid accounts for between one fifth and one quarter of settlers' total income. Assessment of beneficiaries' income levels for the second year of settlement reveals that even with the added value of food aid, beneficiaries barely break even. On the basis of talks with settlers in the fourth year of settlement in 1991, most were still far from achieving self-reliance, and continued to require food aid to support them and their families.

With the new settlers caught in a squeeze between low productivity and low prices for their products and increasing prices for agricultural inputs, there is some justifiable pessimism as to their likely ability to become fully self-supporting.

The Lessons for Desert Reclamation

There are some important lessons from the Egyptian desert reclamation and settlement programme.

1) Thorough land preparation and development is essential. It is also highly expensive. In the case of Egypt, large private agricultural companies appear to be able to bear most of the expense and still be profitable. It is less clear that small-scale farming can be profitable if it has to bear the major part of the land development costs. In this situation, the choice to make land available to small-scale farming involves social as well as economic considerations, and the Government is likely to have to bear the major part of the expenses as part of a subsidy to achieve social goals.
2) Close consideration has to be given to the likely viability of agricultural activities. Products should be developed for known, available markets. Transport links and fair marketing arrangements should be in place prior to settlement. Credit facilities should be available, and may need to be subsidized. Essential agricultural inputs (seeds, fertilizers, pesticides) may have to be subsidized, at least for the initial periods. Unless governments are prepared to carry these costs fully, then small-scale settlement probably should not be encouraged.
3) Selection of participants should be carefully controlled. Participants should be selected for likely economic viability, rather than to meet social or political goals. Thus farmers or ex-farmers probably should be given priority. Participants should be expected to have realistic resources available to them before settlement. Poor settlers are far less able to achieve self-reliance than those who have more resources. Because desert land requires substantial work before it becomes productive, farmers who can afford mechanized equipment are likely to be more successful more quickly.
4) The amount of land provided should be more than sufficient to support a household. Allowance should be made for the next generations. If the children of settlers have to move to find work or land, then the desert reclamation has not properly met its social goals.

Finally, the experience of the Egyptian desert reclamation programme suggests that it is unwise to mix social with economic goals. If desert reclamation is to succeed, it must do so on economic criteria. If social and political goals are also thereby met, that is a useful result, but these should never dominate or adversely influence economic decisions.

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Sustainable Agricultural Development and Halting Desertification in Kuwait

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Abstract

Agricultural development in Kuwait is restricted by many environmental factors such as limited water resources and sand encroachment on agricultural areas. However, research in the precrisis period revealed significant increases in agricultural production. The crisis damaged the agricultural infrastructure as well as other resources. The problem of desertification accelerated after the drastic damage to the desert ecosystem. The government is developing a master plan to promote agricultural production and to halt desertification. This paper gives an overview of agricultural development in Kuwait with an emphasis on environmental constraints. It highlights government plans to develop agriculture and control desertification.

Introduction

The Kuwait environment is harsh, water is scarce and brackish, temperatures are high, and mobile sand belts are prominent. Collectively, these are formidable obstacles to agricultural development. However, in spite of these environmental constraints, Kuwait needs to expand its food production. Many past attempts to increase agricultural production in Kuwait have, to a certain extent, yielded desired results. This has been primarily due to Government support and farmers' efforts.

As the population of Kuwait increased (from 467,339 in 1965 to 2,132,971 in 1990) so did the area under cultivation (it expanded from 2482 ha in 1983 to 4727 ha in 1987) . The invasion of Kuwait in 1990 caused drastic changes to the country's demography as well as forcing all agricultual activity to cease.

The purpose of this paper is to provide an overall pre- and post-war assessment of agricultural development in Kuwait with an emphasis on environmental constraints such as water and mobile sand., It will also highlight the Government's efforts to improve agricultural production.

Role of Agricultural Production in Relation to Need and National Development

Kuwait has imported over 93per cent of its food supplies for the past decade and a half. The monetary value of the food and feed imported has equalled a substantial percentage of the value of the net profit received from the country's major export: oil.

Prior to August 1990, local production of plants and animals fulfilled the following percentages of Kuwait's needs: 20 per cent of vegetables, 3 per cent of animal feed, 6 per cent of sheep meat, 1 per cent of beef and veal, 30 per cent of milk products, and 50% of poultry (broilers and eggs).

Agricultural production used to take place mainly in the coastal areas of Jahra, Fintas, Finaytees, Mangaf, Abu Halifa and Failaka. The produce from those holdings, though limited, was primarily sold in local markets and, due to the then smaller population size, it contributed significantly to the country's food requirements. A number of social, economic and demographic changes have, nevertheless, also occurred since then. Paramount among these changes has been rapid urbanization, which has adversely affected the cultivated areas of former days, particularly in the coastal villages. New agricultural areas have now been designated namely Wafra, Abdaly, Sulaybia and Shagaya (Fig 1).

Plant production embraces not only open-field activities, but also protected environments. Animal production includes intensive production units, i.e. , poultry farms in Shagaya, and "experimental" intensive sheep production in trial holding units.

General Aspects of Agriculture

Kuwait's plant production is low because the climate is harsh, precipitation is a limiting factor (annual precipitation is 105 mm), and water for irrigation is highly brackish (3,000-9,000 ppm TDS). Three types of agricultural production are practiced in Kuwait:

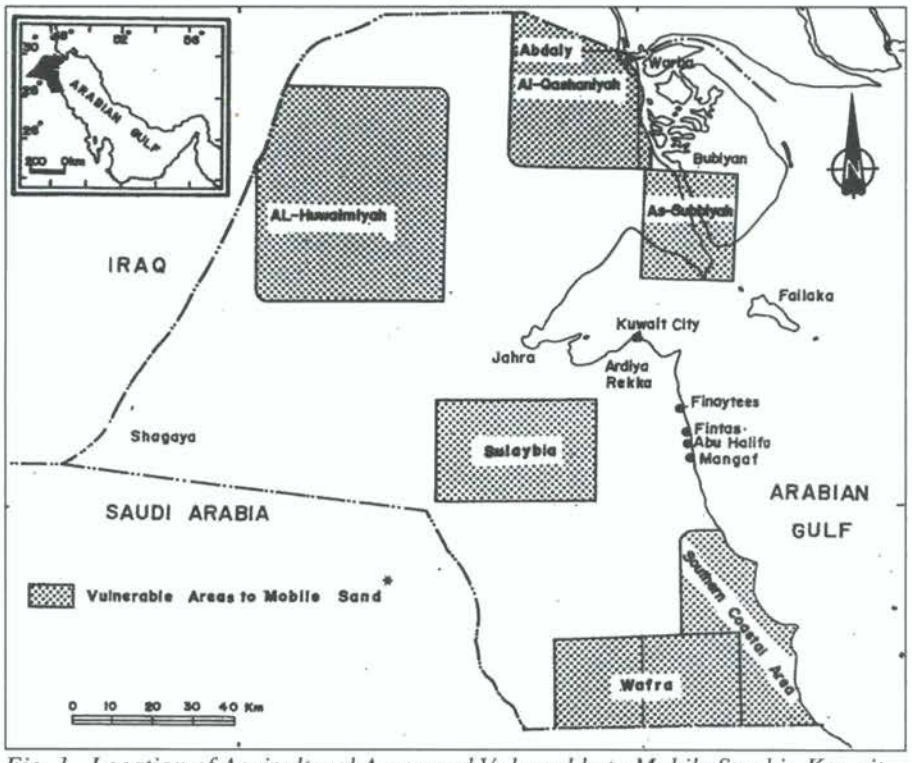

Fig. 1. Location of Agricultural Areas and Vulnerable to Mobile Sand in Kuwait. (after Foda er al., 1984)*

- Irrigated crops, mainly dates, tomatoes,cucumbers, peppers, and eggplants;fruit trees, (mainly date palms), forage (alfalfa and clover) and cereals;
- Irrigated pasture to a very limited extent; and
- Afforestation of shelter belt trees, which although not a crop do count as a protector of crops serving as wind protection and sand control (Rahman 1993).

Most of the crops are irrigated by the drip system, using fresh water. High temperatures are controlled by cooling pads and fans, however, sand and dust accumulate on cooling pads and crops in the fields.

General aspects of Water Sources

Ground water is the only currently available in-country natural water resource that can be used directly without recycling or treatment. This water is found in the Dammam Kuwait Group and Upper Kuwait limestone layers. The water salinity is in the order of 4,000 mg/l (Abusada 1988). Both the Kuwait Group and the Dammam formation have been intensively explored and exploited in Kuwait in the last few decades. It is estimated that the natural recharge coming through the saturated aquifers originating in Saudi Arabia is in the range of 15-20 mg/d (Al-Sayed et al. 1981).

About 60 mg/d of ground water are used in the major agricultural areas (Wafra and Abdaly). Brackish water when mixied with distilled water is used in cattle rearing, dairy farms, landscaping,and in households.

Recycled or treated industrial and municipal waste water is another source of water. Three treatment plants have been developed and reactivated to treat municipal water, they are: Ardiya, Rekka and Jahra (Fig. 1) . The average daily flow rate treated at Ardiya is about 32 mg/d, at Rikka is 11 mg/d and at Jahra about 7 mg/d. About 7 mg/d of treated effluent from the Rekka plant is presently utilized for irrigation of greenery along motorways in the Fintas and Jahra farm areas (Hussain 1993).

Treated industrial waste water, in general, comes principally from the Shuaiba Industrial Area (SIA). Treated municipal wastewater is one of the best sources of water for afforestation and greening purposes because the salinity is relatively low (13002400 mg/l TDS), and the water contains both organic and inorganic material with some nutrient value. Treated municipal and industrial waste water available for the afforestation and greening of Kuwait comprises about 18 per cent of the total dedicated supply from reported data of 1989-1990 (Robert et al. 1982). Fresh water is mainly produced through desalination plants (about 95 per cent) and the remaining five per cent comes from groundwater aquifers. Due to the limited capacity of reservoirs, water consumption is almost equivalent to water production through desalination plants.

Creeping Sand in Agricultural Areas

Mobile sand has a severe impact on agriculture because the agricultural areas are located downwind and within the mobile sand belt (Fig. 1). This can contribute to desertification, i.e., reclaimed agricultural areas can be covered by mobile sand. It would also have an impact on the make-up of soil because the wind would carries off the fine soil .

Fencing and panelling are the main protective measures used in agricultural areas against mobile sand. Huge quantities of sand accumulate up against these fences and panels. Continual dredging of the accumulated sand results in an increase in the cost of agricultural production.

Wafra is located near the southern border of Kuwait, bound to the south by Saudi Atabia and to the east by the southern coastal zone of Kuwait. It occupies about 1250 Km2 (125,000 ha). The surface area is generally flat sloping very gently from west to east with an average gradient of about 5 m/km. A part from a few small hills scattered in the western part of the area, there are no significant topographic features except flat depressions covered with inner *sabkhas*.

Wafra developed as a major agricultural area due to the availability of ground water and its soil characteristics. Being in the middle of the desert, the present and future development established in the Wafra area are and will be affected by creeping sand sheets. Similarly, the Al-

sulaybia area which is located to the south of Kuwait Bay and which occupies 1,100 Km^2 (110, 000 ha) with a flat surface area is also vulnerable to sand encroachment. The area is characterized by many development activities: farming, water fields , oil fields, range research stations and others. The area is affected by extensive mobile sand sheets which are a serious threat to all activities.

Monitoring Changes on Surface Deposits in Selected Agricultural Areas

All the areas that were once classified as having rugged vegetated sand sheets, reported in Foda *e.t. a.l-*. 1984, have mostly been transformed into smooth sand sheets. Omar et al. 1988 reported that 550 km^2 consisted of rugged vegetated sand sheets in the Wafra area during 1984 whereas in 1988, rugged vegetated sand sheets could only be seen on the boarder between Kuwait and Saudi Arabia.

Mobile sand sheets in Sulaybia covered all the smooth sand sheets recorded by Foda et al. 1984 with the exception of two shadows of the range research station and transmission station as they were protected from grazing by fencing. Omar et al. 1988, reported that the rugged vegetated sand sheets at the two stations were separated by mobile sand sheets in 1984, whereas in 1988, the two areas were connected and the rugged vegetated sand sheet inside the radio station had increased from about 15 to 23 km2 because it was protected. Mobile sand however, "invaded" the range station particularly north and west of the station during times of drought (Omar 1990).

Measures to Halt sand Encroachment on Agricultural Areas

Measures and techniques to combat mobile sand and to stabilize sand dunes in agricultural areas have been applied in Kuwait. The methods vary in nature, function and durability. Testing and application of these techniques are met with varied degrees of success and failure due to technical and/or environmental factors. A particular method or technique is dependent on the prevailing environmental factors, goals to be achieved and technical as well as economical feasibility.

A comprehensive review and assessment of the various techniques was presented in Omar et al. 1988. Mechanical methods are the most commonly used techniques to control sand encroachment into agricultural areas. They are based on the principle that placing an obstacle in the way of blowing sand will influence the line of flow and reduce the wind speed. A fence or other obstacle causes turbulence and reduction in wind speed, leading to the deposition of sand. Mechanical techniques to combat mobile sand, fix sand dunes and protect installations were based on the construction of fences made of various materials. At Sulaybia Field Station (range research site) several impounding fences were constructed. These fences successfully deposited the sand around the fence itself. Evaluation of the ecosystem components (such as wildlife and flora) of an area prior fence construction is vital..

In other agricultural areas such as Wafra and Abdaly palm reeds are woven in a checkerboard pattern of fences. Mechanical fences have proven viable but maintenance is continuously required. For example impounding fences have to be raised from time to time to ensure continued effectiveness. Other mechanical techniques used in agricultural areas include surface stabilization by covering mobile sand and dunes with synthetic fibres, petroleum products and chemical compounds.

The Impact of War on Agricultural Development

On 2 August , 1990, agricultural activities in Kuwait came to a complete standstill due to the invasion and subsequent war. The infrastructure and farmers' assets were destroyed during the military conflict near the border with Saudi Arabia (Wafra) and near the Iraqi border (Abdaly). Supplies were pillaged, farms were littered with mines and the soil was contaminated with oil and inflamable products. Experienced agricultural labour fled shortly after the invasion, due to entrenchment of the invading forces and the likelihood that full scale hostilities were eminent (KISR 1992, Cited in Omar et al. 1993).

By mid-December 1991, farming was reactivated in the Wafra area. Field inspection of the area in January 1992, indicated that about 148 farms and 992 greenhouses were in different stages of operation. By the end of May, 278 farms and 2219 greenhouses were operating. The area cultivated, including greenhouses, controlled environment agriculture (CEA) and open field production, increased dramatically over the five month period. CEA production areas, which focused primarily on tomatoes, cucumbers, green peppers and eggplant, increased from 26.2 ha in December, 1991 to 83.8 ha in May 1992. Open field production areas, planted with vegetables, legumes, forage crops and grains increased from 123.7 ha to 513.1 ha over the same period (KISR 1992).

Master Plan for Agricultural Development and Desertification Control

In the post-crisis period the Government of Kuwait developed many programmes including an agricultural master plan, soil surveys, land reclamation and a greenery plan.

Agricultural Master Plan

The master plan for agricultural development sets forth a development study for the agricultural sector that focuses on major requirements (including technology development, water, manpower, land and others) for the development of agriculture in Kuwait. The plan was developed by Kuwait Institute for scientific Research (KISR) upon request from the Public Authority for Agriculture and Fisheries (PAAF) and with support from the Kuwait Foundation for the Advancement of Sciences (KFAS) . The plan considered current and projected demands,

present and projected production, the harshness of the climate and mobile sand encroachment, the limited availability of resources and how biological manipulation can help production. The plan links agricultural development with the environmental constraints, especially water and sand encroachment on agricultural areas (Razzaque et al. 1990, Razzaque and Abdal 1992).

Soil Survey and Land Reclamation Programme

The soil survey project was initiated by KISR upon request from PAAF. The project is geared to delineate arable and highly potential arable lands, update the soil map of Kuwait and other developments such as upgrading research facilities related to soil management and conservation and training of local manpower (El-Prince and Abdal 1992).

The land reclamation programme focuses on existing agricultural areas such as Wafra and Abdaly and implements a plan for alleviating soil problems such as salinity, erosion and sand encroachment. This long-term development project will improve the situation of the agricultural areas and will reduce the negative impact of desertification.

Greening Plan

A major project for the "Preparation of a Strategic and Master Plan for Greenery Development in the State of Kuwait" is currently being developed. This project was almost complete at the time of the Iraqi invasion. The project has been amended to meet Post-liberation needs and also to include assessment of culture techniques to preserve the germplasm of the genotypes that showed unusual tolerance to the environmental conditions. The proposed project will provide new horizons in urban forestry, establish oases, and develop an oasis **entry** (agricultural and greenery belt) based on water conservation measures. The overall objective of this endeavour is to achieve the optimal beautification of the country utilizing sound water management practices (Hussain 1993).

Conclusions

Despite its harsh environment, Kuwait had achieved a significant level of crop production prior to the crisis. The Government devoted considerable resources and effort to support the agricultural sector. In the post-liberation period, efforts have been made to evaluate the extent of damage on resources as well as agricultural infrastructure and manpower. Strategic plans were prepared to develop the agricultural sectors and to improve the environmental conditions. Research institutions such as KISR are developing these plans and providing recommendations to improve the current status to meet the ever increasing demand for food and services.

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Tree Planting: Mobilizing the People of Tanzania

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People, Land and Natural Resources

The future of land and natural resources, especially in a developing country is influenced mainly by the following factors: land distribution according to soil and other natural conditions as well as land use and tenure; water supplies; **growing stock and yield potential** of wood; population and population growth. Of these factors, in Tanzania at least, the present population and population growth are the best known and population growth in the long term is by far the weightiest. Population pressure on soil and trees is overshadowing all other influences on the environment.

Yet, surprisingly, future problems such as long-term population increases tend to be largely neglected in planning efforts and action plans concerning land and natural resources. Mostly neglected, too, is the abundance of people's creativity and energy which could be harnessed - for instance for massive tree planting exercises to combat deforestation and land degradation and in the prevention of future disasters.

The average per capita area of continuously (permanently) cultivated land in the world, according to figures presented in the FAO *Yearbook of Production 1991*, is 0.27 of a hectare. In Tanzania it is estimated at 0.25 of a hectare, in Sweden it is 0.32 of a hectare (Figure 2).

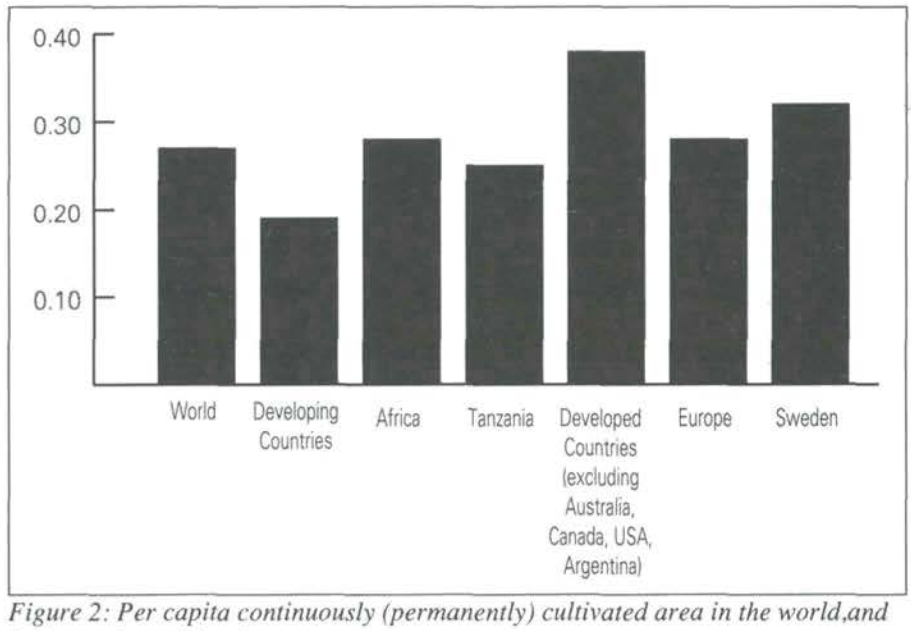

Figure 2: Per capita continuously (permanently) cultivated area in the world,and in Tanzania and Sweden

Estimated future needs of cultivated land in Tanzania, as shown in Figures 3 and 4, is, as a matter of simplification, based on the assumption that the present per capita area will remain constant. A factor which tends to lead to an over-estimation of the needs is the increasing the use of chemical fertilizers or, more likely, encouraging the practice of agroforestry, raising food production per hectare. Two factors which tend to lead to an under-estimation are: increasing cultivation of less productive land and increasing food consumption per capita. These reverse trends are theoretically assumed to balance each other out, and the present per capita figures in this study are also used for long-term future prospects (as in Figures 3 and 4).

The land available for cultivation in large parts of sub-Saharan Africa including Tanzania consists mainly of woodland. The land is, in general, suitable for shifting cultivation if properly practiced,

but not for continuous (permanent) cultivation - at least not without inputs of some form or another for maintaining soil fertility and structure. Nevertheless, due to population pressure, traditional shifting cultivation systems have to a large extent broken down. The transition to continuous cultivation is almost unavoidable.

In developed countries in general, agriculture is characterized by the heavy application of fertilizers and other inputs, greatly affecting yield per hectare. Increased use of chemical fertilizers for continuous cultivation even in sub-Saharan Africa is sometimes assumed. But for most peasants, chemical fertilizers are difficult to obtain because they are expensive and, in many places, unavailable. Poor nations, furthermore, cannot afford large imports.

Instead of using chemical fertilizers for continuous cultivation, soil fertility can be maintained through biological nitrogen-fixing. Intercropping food crops and nitrogen-fixing trees actually add 'free' fertilizer from the air. For most peasants in developing countries, agroforestry is the only realistic alternative.

Leaves and other organic material from trees, when integrated into the farming system enrich the soil and promote growth of vegetation and the absorption of moisture. The roots bind the soil which means less erosion. When sufficient wood for fuel is available, crop residues and cow dung will be used as mulch, which when incorporated into the soil improves its structure.

Agroforestry could be the key to solving the problem of maintaining soil fertility and structure - providing an effective alternative to shifting cultivation as well as be an alternative to using chemical fertilizers. Moreover, it would help ensure food and energy for growing populations.

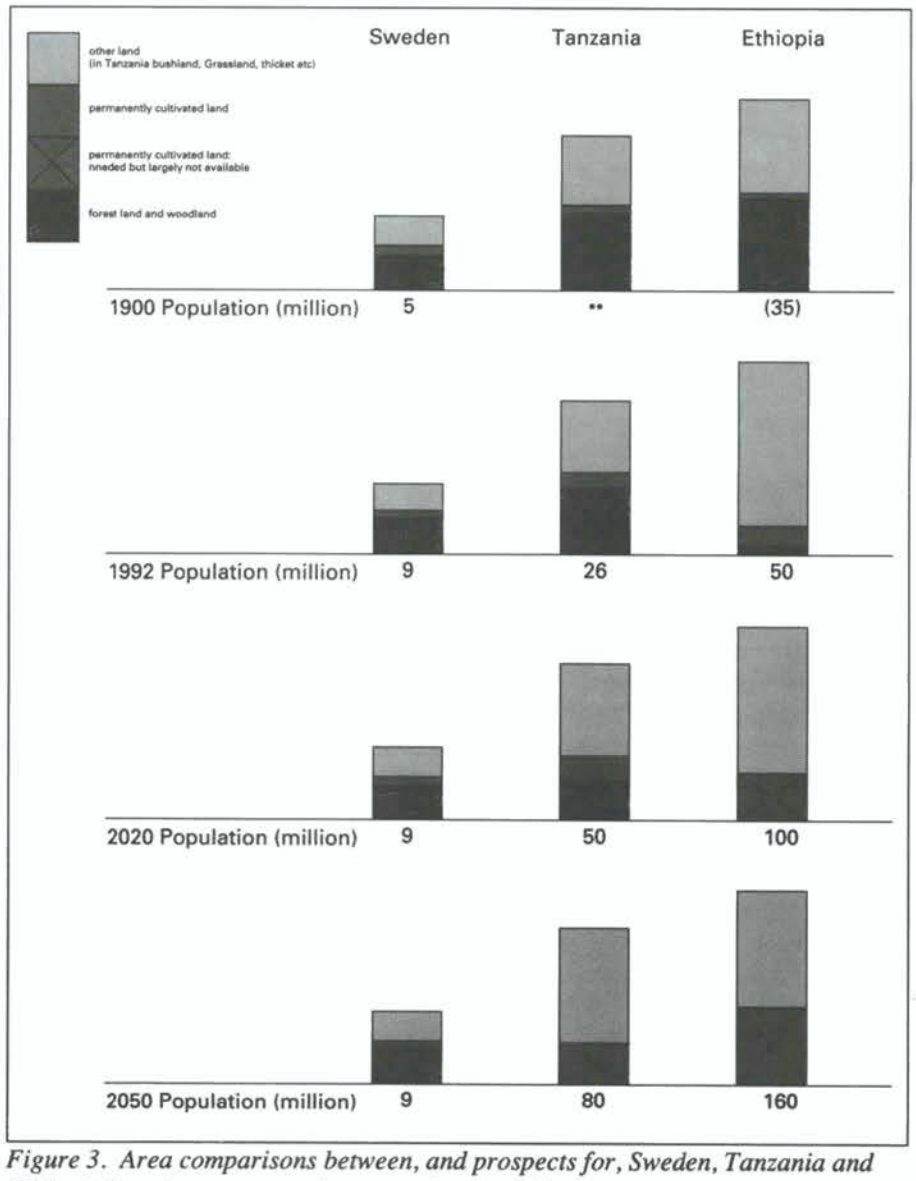

Figure 3. Area comparisons between, and prospects for, Sweden, Tanzania and Ethiopia based on no stepped-up tree planting efforts

Comparisons and Prospects

As Tanzania (then Tanganyika), Ethiopia and Sweden in 1940 had about the same number of inhabitants (some 6 million), it may be interesting to compare the developments, so far, of their populations and the projections for the future (see Table 1).

Tanzania has now a population almost three times that of Sweden - Ethiopia five to six times. The populations of Tanzania and Ethiopia would by the year 2050 probably be respectively at least eight and sixteen times that of Sweden (and in the remote future end up with a stationary population possibly ten and twenty times that of Sweden respectively).

Area comparisons between and prospects for the above three countries are tentatively presented in Figure 3. The prospects for Tanzania and Ethiopia are based on the assumption that no stepped-up tree planting efforts will be launched.

In 1900, forests covered about half of Sweden, forests and woodlands half of Tanzania and half of Ethiopia. In 1992, forests still covered more than half Sweden, forests and woodlands almost half Tanzania - but of Ethiopia only a small percentage. By 2020, the situation in Sweden would not have changed much. In Tanzania, however, the area under forests and woodlands will have decreased by half the present, while Ethiopia will be almost entirely deforested. By 2050, the situation in Sweden will not have changed much. Tanzania, on the other hand, like Ethiopia will most likely be almost entirely deforested. Figure 3 shows how much cultivated land will be needed by then.

Unless action to reverse the trend is taken soon, Tanzania will follow Ethiopia 's example - see Figure 3. Arable land will not be sufficient to feed future growing populations and neither will supplies of fuelwood be adequate.

Tree Planting Needs and Results

Ever since 1967, various afforestation campaigns have been launched in Tanzania. A large national campaign with the theme *Misitu ni Mali* (Forests are Wealth) ran from 1980 to 1984. The Tropical Forestry Action Plan (TFAP) for Tanzania, adopted in 1989, includes only modest efforts to step-up tree planting. The Tanzanian afforestation experience has had mixed results. Opinions vary about the success of the efforts undertaken.

Typically, developing countries are short of money but rich in people. Therefore, any action to combat deforestation and land degradation should involve minimum financial bureaucracy, and be mainly based on the creativity and energy of the people concerned. Tree planting as a popular mass movement would bring quick results.

In view of the growing population of Tanzania, which isnow over 26 million and which could reach 80 million by 2050 (and in the long run reach 100 million), the long-term target (60 years) for tree planting efforts should be formulated in as clear and concrete terms as possible to match the long-term food and fuelwood needs of the projected population.

Based on the above target, the number of trees per head of the rural population in Tanzania is estimated at 10 trees per year for ten years, i.e. per rural household about 50 trees annually through ten years.

The urban fuelwood needs can (theoretically) be assumed to be met through the establishment of peri-urban fuelwood plantations (or other energy arrangements) - or much larger village afforestation efforts would be required.

Afforestation is, in order to simplify the calculations, assumed to be mean the planting of trees even though, in practice, other methods would be involved. For instance, when clearing a woodland area for cultivation, a certain number of trees could be left standing. In this way, new trees could be planted beside those remaining rather than having all the trees cut down only to be replaced by new seedlings at a later date.

Prospects for Tanzania based on non-intensified tree planting efforts (Alternative 1) and intensified tree planting efforts (Altermative 2) are tentatively illustrated in Figure 4.

Year	Sweden	Tanzania	Ethiopia
1900	5		(3.5)
1940	6	6	6
1992	9	26*	50
2020	9	50	100
2050	10	80	160
2100 (stationary population)	10	100	200

*Current annual increase: 2.8 per cent

Table 1. Population Comparisons between, and Prospects for, Sweden, Tanzania and Ethiopia

As a result of the stepped-up activities, deforestation due to excessive fuelwood collection, would (theoretically according to the calculations) cease by the year 2000, and all continued deforestation would be due to clearing for agriculture only. Almost half of the present forests and woodlands of today would be saved for good.

Enough food and wood for at least 80 million people by 2050 (and at least 100 million in the remote future) would be secured.

Mobilizing Action

It has been shown why the people of Tanzania need to get mobilized, the problem is how to do it.

Major prerequisites for a village afforestation programme are: technology; resources; institutions and motivation. With all the means available, lack of motivation may still inhibit action and vice versa. In addition to technology, simple or advanced, and resources (individual human resources), a supportive institutional framework that allows and encourages people to act is required.

In Tanzania, the present village structure offers suitable institutional support for rural development efforts. Ample human resources (creativity and energy), and simple planting technology is available. What is lacking is sufficient motivation for mass action: the crucial task is to find effective ways of motivating and mobilizing the people to action.

The two major approaches applied in the mobilization of local people to participatory forestry action are encouragement ("the carrot") and coercion ("the stick") - used separately or together. The third approach involves trust, which is based on self-reliance and learning by doing.

Tree planting and soil conservation efforts based on coercion were often used during the colonial times in East Africa. This approach is in general based on coercion only. It is difficult to force people to do something without, at the same time, convincing them that the action being is in their own interest. Moreover, it cannot ensure genuine popular support, and may instead create resentment. The people may even find reasons to sabotage the effort or possibly circumvent the activities.

There are, however, "success stories" of this coercion approach which are cited by Johansson (1991) and Bojo (1988). They refer to cases of successful tree planting and soil conservation projects where the top-down approach has actually worked.

Afforestation programmes in South Korea and China are evidence of the successful application of coercion for the mobilization of the masses.

A mobilization approach based on encouragement only i.e. voluntary participation in a forestry programme compatible with the conventional community forestry concept has been adopted in most countries including Tanzania. Encour-

agement includes conventional efforts to increase knowledge, to remove other constraints and to provide incentives. This approach is time consuming and in the context of large-scale afforestation programmes requires a lot of money and a large number of extension staff.

A mobilization approach based on a combination of coercion and encouragement for participation in forestry programme has been practised in some countries, notably South Korea and, partly at least, China. These two countries have carried out probably the most successful village afforestation programmes ever and are known as the forestry successes of the 1970s. But, as in the Korean case, such programmes are characterized by heavy governmental intervention and involvement including detailed land-use planning to determine suitable sites for the tree planting, allowing little room for individual initiative. This method can be very expensive -more than a poor country can afford.

Suggested Mobilization Approach

In the efforts to combat deforestation and land degradation, the time factor is critical, especially in the light of rapid population growth. The conventional community forestry approach, based on encouragement and voluntary participation, is time-consuming. The chronic shortage of extension staff, funds and limited skills hampers action. Therefore, in the race against time, a short-cut is obviously needed.

I suggest a balanced combination of encouragement, coercion and trust (figure 5) coercion with trust providing the short-cut required. Self-reliance rather than participation is the key to this concept. Coercion and trust go together with encouragement.

The constraints of insecurity concerning the rights and fair distribution of proceeds from the planted trees in communal woodlots would first need to be removed.

Coercion is important for several reasons. The efficiency of a mass movement including the whole chain of action - from seed and seedling production (and distribution) to tree planting - depends largely on organization. Without an element of coercion, it would be too loose. Organization would be facilitated when each rural household is compelled - by law as suggested - to plant a certain number of trees a year. Extension campaigns would be more effective when directly concerning the planting of a compulsory number of trees. The law should also give everybody the right to plant trees.

Trust means, first of all, confidence in villagers' abilities. While planting a certain number of trees would be compulsory, the planting methods and locations would be left up to the people. Coercion with trust, and thus learning by doing.

Hence, the suggested mobilization approach would challenge the rural people to assume the role of primary actors in tree planting efforts. They would be trusted as actual or potential "professionals", with tree planting as a component within their farming system. Scale and pace of action would largely be independent of the availability of staff and funds.

Action would be based on the creativity and energy of the millions of people concerned, at a minimum cost and with minimum bureaucracy. Government spending would be required mainly for seed supply, compaigns and extension. Seed distribution to the villages could possibly be organized though cooperatives. The district, in cooperation with extension services and forestry administration would be in charge of monitoring and evaluating progress of efforts at the

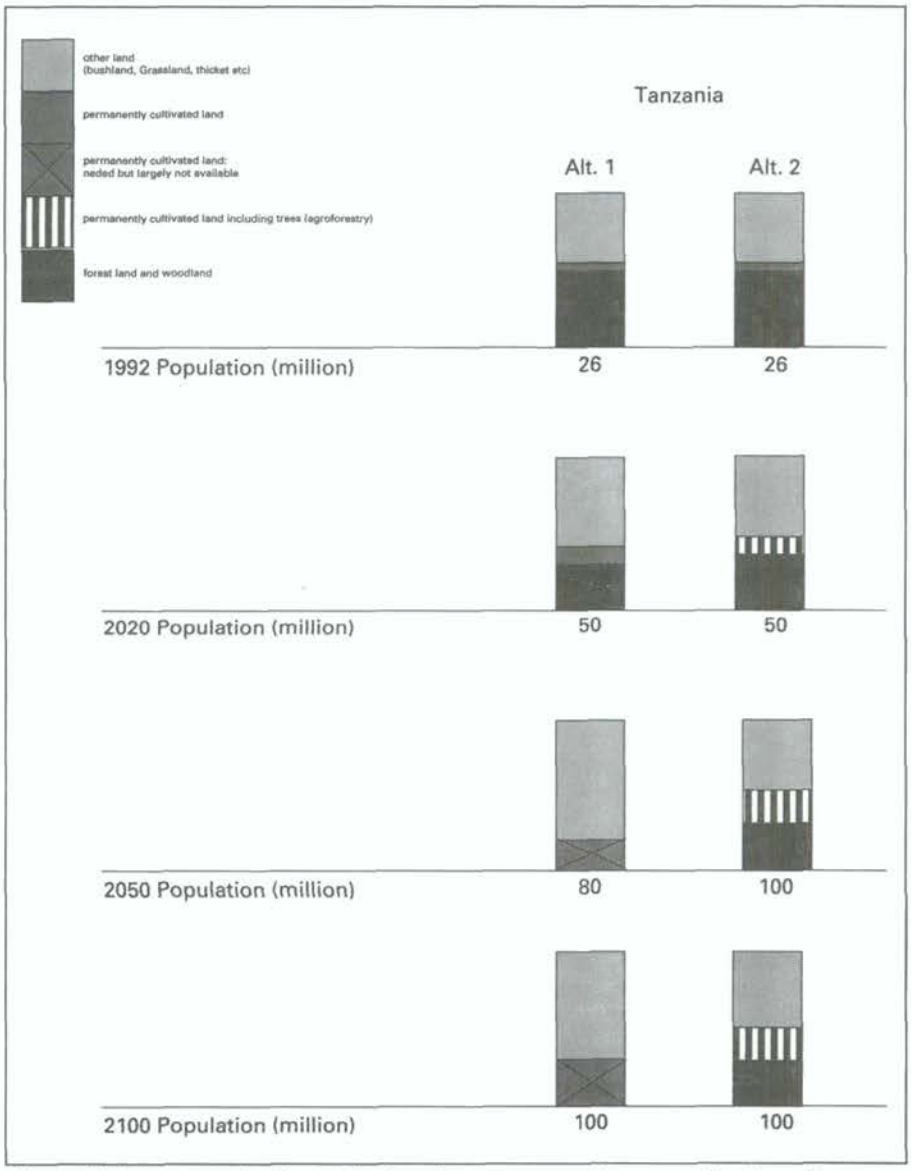

Figure 4. Prospects for Tanzania based on no stepped-up tree planting efforts (Alternative 1) and on stepped-up tree planting efforts (Alternative 2)

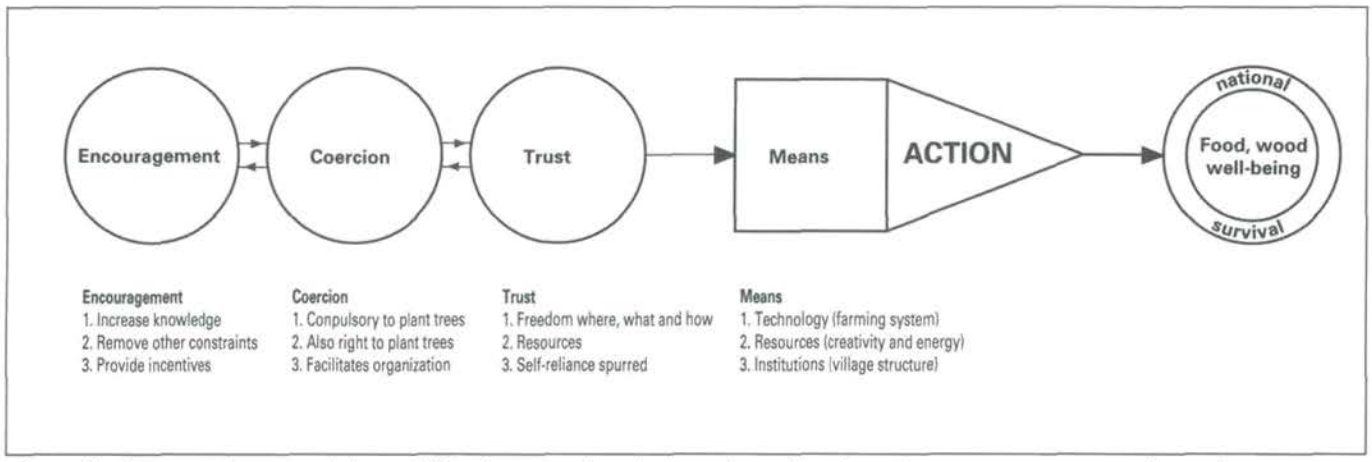

Figure 5. Suggested approach for mobilization to action: balanced combination of encouragement, coertion and trust.

local level - in cooperation with extension services.

The village authorities would be responsible for the required seedling production both in village nurseries and, in many small private on-farm nurseries. They would also be responsible for law enforcement including implementation of the programme.

The tree planting would, to a certain extent, be a communal effort, for example for erosion control and land reclamation purposes and for the establishment of communal woodlots. Most tree planting efforts, however, would be individual, largely within the farming systems (including agroforestry) and would involve women as much as possible.

After some initial difficulties to get the system functioning, the required actual tree planting work inputs would not be very significant . The extra work for the tree planting itself (excluding preparatory and maintenance work, which can be spread over time) would take a day at most every year for each household i.e. for all rural Tanzania during a ten-year period a total of some ten days.

The present more conventional community forestry efforts, backed up by the recently adopted Tropical Forestry Action Plan for Tanzania would form the basis of the mass mobilization movement.

People's willingness to plant trees is largely influenced by the cultural and socio-economic context of the community. For each community it is important to find out this context as well as the physical environment.of the advantages of tree planting and land-use planning is carried out in detail - where, what and how to plant - and a forestry programme is agreed upon and eventually implemented. Scale and pace of action largely depends on a number of extension officers being available.

The suggested approach here compels people, by law, to plant a certain number of trees. However, they are free to act within their cultural and socio-economic context and physical environment - whatever it is. Coercion with trust is more likely to win the race against time.

The people concerned are to be motivated as primary actors. The forest department and other outsiders, on the other hand should "participate" in the people's activities (Cernea 1991b). The scale and pace of action would to a large extent be independent of the availability of staff and funds.

Considering the large number of villages in Tanzania (over 8,200) and the shortage of extension staff, the task may be too extensive for conventionally designed strategies (while the grass grows, the horse starves) in order to succeed the 'carrot' will need to be complemented by the 'stick' and trust.

The Ecological Destruction of Cholistan Desert and its Eco-regeneration

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Introduction

Pakistan is a tropical country with vast semi-arid and arid tracts of land spread over 68 million hectares (72 per cent of its landmass) receiving less than 250 mm of rain a year. All its provinces possess large chunks of such land, i. e. Punjab 119,310 sq. km. , Sind 134,896 sq. km. , Baluchistan 149,467 sq. km. The increasing incidence of drought, desertification, deforestation and soil erosion is causing grave concern. Any further deterioration in the present status will bring aboutadverse changes with disastrous consequences.

Cholistan desert is a very important arid tract covering an area of about 26,000 sq. km. in the south east of Punjab. In spite of its low productivity, this desert sustains a relatively high human and livestock population,0. 10 millionand 2. 0 million respectively. There is a tendency to increase the livestock population because it is the pastoralists onlylivelihood of pastoralists, but this is at the expense of thefragile ecosystem. Degradation of the land is verified by the old people of this desert. This over-exploitation of vegetal resources is causing environmental degradation which threatens the growing population of the country.

Photo 1. Freshly rippled and dunned landscape in Cholistan, Pakistan. Photo: M. Arshad

The average annual rainfall of this desert varies from 100 to 250 mm, falling mostly between July and September. During the summer, the temperature reaches 50 C with very low relative humidity. Low carrying capacity twinned with overuse depletes the natural vegetation often compelling the migration of desert dwellers and their animals towards the canal colonies. The topography of this desert is largely determined by the sheet movements of sand on a large scale leading to rapid changes in the drainage system, forcing thewater table to fall and consequently depleting vegetation and increasingdesert conditions.

The most spectacular land forms are the sand dunes. A variety of dunes such as coalesced, parabolic, longitudinal, transverse, barchan and obstacle are found here. In between the sand dunes, finely

textured but lifeless hard plains *dahars* exist. Being very saline and impervious to rain water they remain predominantly plantless.

Ecological Destruction

Erratic and unpredictable rainfall, low humidity, extremes in diurnal temperatures, are compounded by increasing livestock numbers and the consequent decrease in vegetation cover triggering unmindful desertification.

Trees, shrubs and even roots are indiscriminately cut for fuel, feed, fencing and the construction of thatched huts called 'gopas'. Moreover, the desert inhabitants have adapted their diet to the desert by eating fresh and air-dried seeds, pods and floral buds off the trees and bushes. Fruit from *Capparis decidua and the pods of Prosopis cineraria are harve*sted for human consumption. Fruit from *Zizyphus spina christi* are harvested for human use. Floral buds of *Capparis decidua, Calligonum polygonoides* and *Caraluma edulis* are cooked as a vegetable.

The seeds of some grasses i. e. *Panicum turgidum, Panicum antidotale* and *Cenchrus ciliaris* are used as food especially during drought years. Increased seed consumption is adversely affecting the natural process of regeneration of these species severely crippling the life pattern and reversing the natural successional trends, ultimately degrading the environment. Unplanned grazing, increased human activity coupledwith high velocity summer wind storms enhance the aridity and desertification in Cholistan desert. Similar phenomena are occurring in Thar (Sind) Thall (Punjab) Kharan and its adjoining areas (Baluchistan).

Photo 2. Graziers and desert, the bread and butter of pastoralists. Cholistan, Pakistan. Photo, M. Arshad

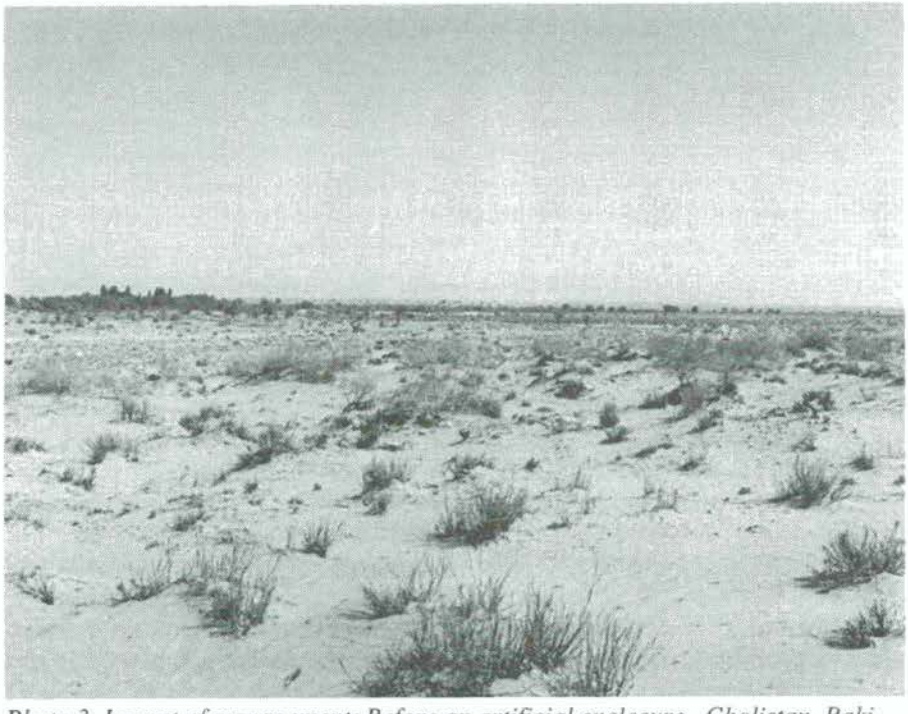

Photo 3. Impact of management: Before an artificial enclosure. Cholistan, Pakistan. Photo, M. Arshad.

Eco-Regeneration of Vegetation

Increasing population pressure is resulting in the utilization of desert vegetation to such an extent that theflora of the region is being degraded. Protection of and controlled grazing in the depleted habitats, preferably through the establishment of enclosures is what is needed for the region's quick revival. A chain of permanent enclosures should be established in distinct habitats such as sandy alluvial plains, sandy undulating alluvial plains, sand dunes and saline plains inside the desert. A fewisolated inclosures established inside Cholistan on an experimental basis have shown a marked increase in floral cover, in some cases a seven to eightfold increase in the past decade or so. These entities arenot onlyseed banks of the area but aredemonstrable models for the area,yet to be fully appreciated by the nomads.

In the interests of halting global environmental deterioration the development

of these grazing grounds is necessary. Plant succession should be arrested at the stage of grass cover, including desirable shrubs. The data on enclosures becomes enormously useful if attention is focused on some of the successional seral stages. Assisted ecological management such as soil conservation measures, reseeding and reforestation with trees or shrubs adapted to the harsh environmental conditions of the Cholistan desert are highly desirable activities.

Conclusion

The protection and management of degraded habitats/vegetation through enclosures increases its biomass production, Such models not only survive as examples to be followed but asseed banks for the area. There was a definiteincrease in the density and frequency of endemic species and their composition. Biomass production in the enclosure increased by almost eight fold in a decade. The duration of controlled grazing will have to be determined for future guidance.

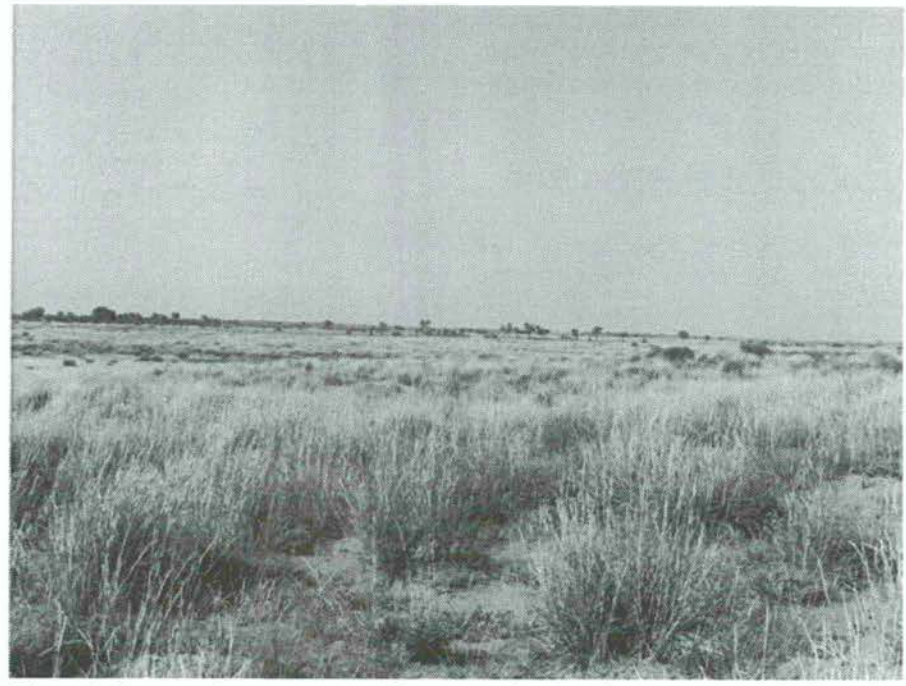

Photo 4. Impact of management:After an artificial enclosure. Cholistan, Pakistan. Photo, M. Arshad.

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The Deterioration of the Environment in Africa's Drylands and river Basins[1]

1 Paper Presented at the Seminar on Research Activities at Bura Irrigation Fuelwood Project 1984-1993, organized by the Kenya Forestry Research Institute (KEFRI) and Finnish International Development Agency (FINIDA) held in Nairobi, March 8 - 10, 1993.

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Abstract

The drylands in Africa are faced with serious environmental deterioration, largely due to rapidly increasing human and animal population pressure. This deterioration is being extended to the river basins within the drylands as people seek a living in these key production areas. This crisis has manifested itself in resource depletion and declining productivity. The development interventions in the drylands and river basins have not helped to alleviate the environmental crisis; in fact, they have aggravated the situation. The plight of millions of people in drylands calls for viable solutions. However, an understanding of the dimensions of the crisis is limited due to a lack of baseline data.

Introduction

This paper is primarily concerned with the broader issue of environmental degradation in Africa's drylands and river basins. The aim is to highlight the creation, nature, and factors accounting for this deterioration and also to identify some research activities that are needed to plan remedial action programmes to stem this crisis.

African Drylands

The drylands in Africa, including hyper-arid deserts comprise 1,959 million ha or 65 per cent of the continent and about one third of the world's drylands (UNEP, 1991/92). One third of these African drylands is hyper-arid deserts (672 million ha) which are uninhabited except in oases. The remaining two thirds or 1,278 million ha comprise arid, semi-arid and dry sub-humid areas. The latter is sometimes referred to by the acronym ASAL which denotes arid and semi-arid lands.

Some 400 million people (about two thirds of all Africans) live in ASAL. This population can be categorized into three broad groups on the basis of their agricultural practices and where they live:

- The sedentary farming population found mainly in the river valleys;
- The agro-pastoralists with, in some cases, significant rain-fed cultivation found beyond the riverine floodplains in the adjoining interfluves and upland savannas;
- The nomads, engaged almost exclusively with livestock keeping and who are found in areas further away from the rivers in the more arid parts of the ASAL.

In the ASAL, the dryland vegetation is a fundamental resource which protects and stabilizes the surface of the ground. This vegetation survives by adapting to water deficits in ways which are important because it determines seasonal differences in the usefulness of the dryland pastures.

Under natural conditions and through appropriate strategies the dryland ecosystems maintain a balanced exchange of water and energy. The equilibrium is readily disturbed when the meagre vegetation is reduced by man's actions that expose the ground surface. When the surface has been loosened or disturbed, the top soil layer, with the best structure and the bulk of plant food, may be washed away or blown away in dust storms. All these changes mean a more hostile environment for plants. Vegetation will respond less well to rain, produce less biomass and many plants will die at an increasingly early stage of drought. Such stages are typical of desertification.

Mobile Animal Husbandry and River Basin Resources

In the ASAL good dry season pasturage is characterized not only by a solid fodder base but also by water resources of sufficient quantity and quality (Janzen 1991b). Favourable conditions of this kind are found particularly in the flood plains of the seasonal and permanent rivers which drain into the ASAL from the surrounding highlands and plateaux. This is not only true of the Senegal and Niger with

their tributaries, but also of the rivers flowing into Lake Chad, of the Nile and its tributaries, the Shabeelle, Juba and Tana in eastern Africa and of the Zambezi in southern Africa. As the main settlement areas of the sedentary agricultural population are also concentrated along these rivers, the river basins have been pivotal for the survival of the nomadic population during the dry season. For the nomadic activity of mobile animal husbandry in ASAL areas, river basins have traditionally fulfilled five major functions. First, they have been sources of perennial water, the main lifeline for man and livestock during the dry season. Second, the dry season pastures with their rich growth of grass provide a solid fodder base for animals. Third, these drainage basins are of great importance to the riparian woodlands which contain a major portion of the browse resources of the ASAL. Fourth, the harvest leftovers on the farmers' fields are an important additional source of fodder for the livestock. Fifth, and not least, the larger permanent settlements in the river basins are important market places where lively exchanges take place between settlers and nomads, who can stock up here with the goods they don't produce themselves and in return sell livestock products. (Janzen, 1991a).

The mutual economic and social exchange relationship with the settled elements of the population, and in particular, the unfettered access during the dry season to the water and fodder resources of the river valleys in the drylands have been of crucial importance for the survival of the nomad and his cattle. For example, a district-wide survey carried out in 1982-1984 in Turkana (Eco-systems Ltd. 1985) noted that:

In 23 per cent of the district, woody vegetation is virtually confined to riverine strips. These areas coincide with the driest eastern parts of Turkana and dry season grass cover was found to fall consistently along a gradient of increasing importance in the riverine vegetation. Despite the acute shortage of grass, areas of exclusively riverine woody vegetation supported over 30 per cent of all livestock in the district during the dry season, underlying their extreme importance as a dry season forage reserve.

The Turkana pastoralists realize the importance that this riverine vegetation plays in their lives.. They have developed important traditional ownership rights to the extensive riverine forest and vegetation areas (called ekwar) together with traditional watering points. Along the 200 km length of the Turkwell river in Turkana district betweem 20,000 and 40,000 people depend on their ekwars for food for their livestock (Darkhoh, 1990a).

Whereas, generally, the sedentary population in settlements in river basins in the wetter parts of the ASAL hardly practise animal husbandry because of the danger to the animals from the tsetse fly, the agro-pastoralists and particularly the nomads keep large herds. The importance of the mobile livestock economy in the African drylands lies in its dual role of safeguarding the future existence of the individual families that are dependent on livestock rearing and also of preserving the economic potential and ecological balance of the grazing grounds themselves (Janzen, 1991b).

Rapid Changes

Today, because of the rapid changes taking place, the African drylands are undergoing a crisis of unprecedented proportions and this crisis is extending to the river basins withn them, with deleterious consequences on both the natural environment and the human condition. Due to the increasing human and livestock population and the effects of drought in these drylands, the available soil, forest, water and grazing resources are under stress. There is a strong wave of migration to the river basins from adjacent drought-hit drylands and from other highly populated and overpopulated humid zones.

Faced with recurrent droughts, inadequate and unrealiable rainfall, a rapidly rising population, hunger and famine, African countries have turned to the river basins within their drylands for solutions to the problem of feeding their people, and obtaining foreign exchange. Research by FAO (1984, 1987) and other national and international organizations has revealed that these African river basins have a lot of unused agricultural potential which needs to be tapped. It is because of this perceived potential that many large-scale mechanized schemes, irrigation projects and resettlement schemes have been initiated and implemented in these zones on the assumption that this underutilized potential can be brought into more productive utilization to solve the food and foreign exchange crisis. African river basins have attracted not only the attention of national governments but also of international capital and individual foreign and local investors (Salih 1992, Darkoh 1992b).

Conflicts

Many large-scale mechanized schemes, irrigation projects, resettlement schemes and big dam projects have taken away lands traditionally used by pastoralists during drought to alleviate pressure on the fragile dryland environment. The food security policies of African nations which see the key to agricultural development as the expansion of large scale projects rather than in improvement of the production conditions for mobile animal husbandry and smallholder farmers are contributing to the insecurity of the herders and small farming communities. The rights or needs of small scale producers and mobile livestock keepers in the river valleys are often given scant attention in development planning, a fact which can and has actually aggravated conflicts (Janzen, 1991a).

Because of their role as key production areas in the drylands, river basins are the source of various land use conflicts. Conflicts arise between the various production sectors, the major contenders being agriculture, livestock, wildlife and urban settlement. These conflicts arise because of the lack of coordinated land use policies for ASAL in several countries. Each sector views the key production areas as the best resource base for their development objectives. What follows is intense competition for the same areas and without a mechanism to prioritize competing uses, the resulting land use is not necessarily the most appropriate to the ecological conditions. In some countries such as Zimbabwe and Kenya, some of these key production areas have been gazetted as National Parks or Forest Reserves, thus resolving the

conflict in favour of wildlife or forest preservation. The recent controversy between Coastal Aquaculture Ltd. on the one hand and the East African Wildlife Society on the other over the use of the Tana Delta in Kenya (see for example, *Sunday Nation*14/2/93: 14; *Standard*24/2/93:4) is one example of the conflicting commercial and conservationist interests that characterize competition for river basin resources in African drylands. Other parts of river basins in the drylands of Africa have become farmland or urban centres have developed spontaneously or under government directives. This has caused the marginalization of the weakest sector - pastoralism.

Because of the endemic marginalization, the pastoralists have had little alternative but to utilise more intensively and at times over exploit the range and water resources available to them. The decrease in available pasturage with simultaneous increases in livestock results in overgrazing. The consequent overgrazing causes the destruction of vegetation, soil erosion, desertification etc. and thus the destabilization of the ecological balance in the river valleys and their adjoining upland savannas (Janzen, 1991a, b).

In some countries mobility of wildlife outside National Parks and Forest Reserves creates further conflicts with agriculture and pastoralism. Increased fencing of privatised farmland blocks movement corridors between wet season and dry season pastures and wildlife ranges. The disruption of migratory routes is contributing to situations where certain migrating species of wildlife have missed migration or migrated and not returned because their routes have been interferred with.

Mohamed Salih (1992) has noted the diverse socio-economic conflicts caused as a result of the polarised population interests over river basin resources - the inherent conflicts between different systems of land use (traditional vs modern), economic interests (landlords vs tenants) and even between the same subsectors (pastoralists vs peasants). Salih notes that the victims of drought and famine who seek refuge in river basins are often confronted by well-established old-timers and long standing landed property rights which in many cases exclude others. Recent calls for land reform by the progressive political elites have fallen on the deaf ears of the wealthy and powerful whose political and economic interests are threatened by those of the poor. River basins are examples of areas where such conflicts can transcend ecological considerations to trigger into major social and political disasters (Darkoh, 1992b). Witness, for example, the recent interstate conflicts between Senegal and Mauritania over the utilization of the resources of the Senegal basin.

The Consequences of Rapid Urbanization

The effects of uncontrolled population growth are often compounded by the consequences of rapid urbanization, which lead to widespread destruction of vegetation, soil loss and a decline in productivity of the land-base. All the countries of the Sudano-Sahelian regions of Africa have experienced strong migration to towns (UNSO, 1992: 10). Satellite data on both small and large urban centres in the drylands and river basins of Africa provide clear evidence of continued ecological degradation.

Urbanization itself is increasingly giving rise to other environmental problems. The cities of African drylands are growing so fast that water, waste and power facilities cannot keep up. Vast squatter communities are springing up in the peri-urban fringes of most of these cities. The health problems in such cities are truly environmental in origin. They result from a lack of clean water and sanitation, compounded by emissions from poorly maintained vehicles and uncontrolled industrial pollution. The lack of waste treatment regulations and control cannot be blamed wholly on migration and population growth. However, spontaneous unplanned and uncontrolled growth of the urban areas makes dealing with the problems that much more difficult.

The exploitation of resources around dryland towns is leading to deforestation, increased soil erosion and sand dune encroachment. The rapidly growing demand for charcoal among urban populations is leading to severe desertification within a 40-50 km radius of many urban centres in eastern Africa and the Sahel. According to some reports, rising charcoal consumption in the Sudanese capital, Khartoum, has caused the area of charcoal production to shift to the south by an average of 15 - 20 kms per year. The charcoal supplies for Khartoum now come from as far away as 400 kms .

Commercialization of Nomadic Pastoralism

In recent years large sections of the nomadic livestock economy in the ASAL have experienced rapid commercialization. This has occurred mainly in the Kalahari region states such as Botswana (Cooke 1983, 1985) and the states of north east Africa, though, to a lesser extent, the same trend is also apparent in all the countries of the Sahel (Janzen, 1991a; Stern 1988; Reusse, 1982). The main causes are the explosive growth in the size of the urban population and an associated steady increase in the levels of meat consumption, coupled with the new opportunities for export now offered by more developed and affluent neighbouring countries. In the case of Somalia and Kenya, this means the Arab oil states. The combination of the dynamic new market forces and the reduced distances of pastoral migration, because of their more settled lifestyle and the economy, has initiated a process of structural change in the course of the past two decades throughout all the ASAL lands of Africa. In almost every country, this process is now gathering further momentum and increasing its scope, due in no small part to the State's direct and indirect development measures being offered to nomadic herdsmen to adopt a sedentary way of life. The most serious repercussion is the increased pressure on natural resources in many areas. As a result of the fragility of the traditional economic system in these countries, there has been severe ecological damage in a large number of places. The main causes are the reduced distances which livestock now roam and the heavy concentrations of men and animals around new, high capacity watering places (Janzen 1991a:8).

Civil Strife, Inequitable Financial Arrangements and Terms of Trade

The effects of population pressure, urbanisation and commercialization on the pastural economy and land resources in African drylands are exacerbated by other factors such as civil strife which influences resource systems and availability of food, jeopardizing both environmental and human security; social and political systems which lead to unequal access to resources; inequitable financial arrangements and terms of trade which force dryland countries in Africa to overexploit their limited resources for survival; and developmental conflict between export-based cash crops and foreign exchange needs on the one side and basic food security for the poor on the other side (Darkoh, 1989: 53). Where cash-cropping is important, there is often a tendency for cash crops to take up the best land while subsistence farmers are forced on to marginal lands or lands unsuitable for cultivation and particularly vulnerable to desertification.

Ill-conceived Development Interventions

Another dimension of the crisis in African drylands arises from the hasty and ill-conceived developmental interventions that have been attempted in these zones. These interventions have several shortcomings. The models which have been adopted have been derived from the experience of European nations and the rest of the Western world. These models have frequently served primarily the interests of a few privileged Africans and the economic interests of the highly industrialized nations. The technology utilized is advanced, resulting in large-scale borrowing. In most cases hasty and ill-conceived aid projects are initiated in the drylands. Most of these projects have been designed by foreign consultants with little or no knowledge of the specific technology that is appropriate nor have the skills, experience and knowledge that African people have about their environment been adequately addressed. Many of these projects have attempted to drastically alter the traditional systems and offer alternatives which are not competitive enough. Development interventions in African drylands have had a false start, hence their failure and the low positive impacts they have had on the recipient communities.

Many development assistance projects have been introduced in the drylands of Africa on the presumption that pastoralism is archaic and no longer a viable way of life. They have attempted to change the economic base by offering agriculture and fisheries as alternatives to pastoralism. Some of these projects have not been adquately thought through and have offered "quick fix" solutions such as the sinking of boreholes, planting maize, cotton and other cash crops. This intervening strategy of developing alternative economics has not been successful largely because the alternatives to pastoralism have not offered competitive solutions and also because they have worked to the detriment of the pastoralists as well as the natural environment (Darkoh, 1990, 1992a and c). An example of this is the attempt at sedentarization of the Turkana of northern Kenya. The Government of Kenya and donors have sunk colossal sums of money into the development of fisheries and irrigated farming in Turkana. Both the fisheries and irrigation projects were highly mechanized and some reports have calculated that about US$ 65,000 per hectare have been invested in irrigation schemes at Katilu and at other smaller centres in Turkana (Darkoh 1990a).

The Turkana irrigation schemes have been a dismal failure. There is damning evidence of the adverse impact of the schemes on the lives of the local people involved. Helland (1987) notes: "there is now the sobering realization that after 20 years of development the population on the irrigation schemes have lower incomes, are worse fed and worse off than the pastoralists". Besides, the irrigation schemes have impeded access to river fronts and water points and have removed valuable browse and grazing resources from pastoral use. They have tended to conflict with existing land use systems through competition for key areas and have taken lands necessary for survival by pastoralists in dry years (Darkoh 1990b).

In Somalia, the great Dhabaadheer drought of 1974 led the Somalia Government to establish permanent settlements for a large part of the nomadic population. More than 100,000 nomads previously from the northern part of the country who had lost their basic source of livelihood were relocated in 1975 with the help of Soviet aid by a process of "voluntary compulsion" into six settlement projects, three based on agriculture and three on fishing. Despite considerable effort on the part of the State, all these projects must now be classified as failures due to the hasty way in which they were implemented, the serious mistakes that occurred in the planning process, and most of all, the nomads' aversion to the State taking decisions for them and State control in general. Subsequently, there have been no new settlement projects proposed by the State (Janzen, 1991a: 13).

Elsewhere in African drylands, there have been attempts to channel development funds into livestock and range improvement projects. The major objective in this case has been an attempt to develop a strategy of resource exploitation that would be an efficient as traditional pastoralism and yet have a chance of coping adequately with the greatly changed conditions of the twentieth century African life. In Botswana, modern ranches with exclusive rights under leasehold tenure were introduced and they have been a failure as well due to, among other things, design and management problems and the fact that the majority of the tenants were absentee farmers who visited their herds occasionally (Hitchcock 1982). In the last two decades or so some US$600 million in international development funds has been invested in modern ranches and other rangeland improvement projects in the drylands of Africa (Skoupy 1988: 32). To date, however, there is very little to show for this investment.

The repeated failures of development interventions point to the need for a careful reassessment of the potential of African drylands and their possible development prospects and strategies. As Kenya's

experience with development interventions has shown many of the ASAL countries in Africa cannot become areas of production which can prosper agriculturally beyond mere self-sufficiency of the population because they lack the natural resources to do so. One must be very clear about this fact.

Other Factors

It is estimated that Africa has 57 out of the 200 major river basins in the world. Twelve of these river basins are shared by four or more countries, with the Nile, for example, shared by ten African nations, Niger ten, Zambia eight and the Volta six (Timberlake), 1985: 197). African river basins have an international character and as such many countries cannot embark on large scale river basin projects without affecting the interests of other countries. The construction of dams for irrigation and hydro-power upstream usually impedes similar developments downstream, and as illustrated by the Khashm el Girba Dam in the Sudan could have had serious ecological repercussions on the area downstream (Abdel Ati, 1992). Some cases have shown that such projects may precipitate interstate conflicts as has happened between the Niger and Nigeria over the two dams on the river Lamido and river Maggiya, and between Nigeria and Cameroon over the Ladoo Dam on the Benue river (Salih, 1992: 16). River basin development is currently leading to undesirable negative effects. The Gerado Basin Project in Ethiopia reveals the effects that result from poor spatial planning and lack of an integrative framework in river basin development. Although the resettlement and land reform programme introduced by the Mengistu regime has had positive effects, spatial planning in the Geraldo River Basin has failed to view river basin development in a comprehensive and integrated framework, with the consequence that resettlement is creating ecological pressure in river valleys and increasing social and economic differentiation between the latter and the adjoining highland areas (Melasuo and Worku, 1992). This points to the need for an appropriate spatial policy that should deal with the diverse problems of river basin and adjoining highland development as a comprehensive system of interdependencies.

Among the other conspicuous undesirable impacts of river basin schemes are water-borne diseases, diseases associated with excessive use of chemicals and fertilizers and their impact on health. It is also observed that resettlement schemes are expensive to maintain and that in most cases they do not recover their cost as fast as their cost-benefit may suggest. River damming has been shown to have negative impacts on riverine and/or floodplain forests. It has been observed that the construction of the Turkwel Dam in Kenya is likely to negatively affect the downstream forest and communities (Darkoh, 1990a). Evidence from the Bura irrigation scheme (Hughes, 1985, Johansson 1992) points to the deleterious effects resettlement is having on the forest resources in that part of the Tana basin because of the increasing demand for wood resources. The Bura scheme included a forestry component, but planting started five years after the first settlers had arrived at Bura. About 15,000 to 20,000 people moved in and began creating new pressures on the forest resources with the result that by 1987, they had removed an estimated 100,000m3 of wood.

To summarise, the harsh truth emerging out of this discussion is that African drylands are facing environmental deterioration and this deterioration is extending to the river basins, largely because of the rapidly increasing population, recurrent droughts, food shortages and the continuous movement of people from overpopulated high potential areas and adjoining drought-prone drylands. UNEP's latest (1991) assessment shows that 18 per cent of irrigated croplands, 61 per cent of rainfed croplands and 75 per cent of rangelands in the drylands of Africa are affected by desertification and land degradation of a moderate or high degree. Although there are no directly measured data on environmental deterioration and its social and economic consequences for the drylands as a whole, certain case studies and unpublished statistical data for some countries in the drylands indicate that the situation is getting worse rather than better. With the unprecedented and continuing movement of people and competition for river basin resources, it is clear that we can no longer assume that the environmental crisis in African drylands will not repeat itself in one form or another in the river basins. The dilemma is that ecological degradation in the drylands has the potential of furthering ecological degradation in the river basins and enhancing hostilities between various groups of users, ranging from small producers to states and interstate conflicts. My fears are that if left unchecked, these conflicts and the degradation of river basins may become a source of local and regional instability in the future. This stark reality challenges all social and physical scientists to find ways and means of mitigating the crisis.

Research Fronts

It would appear that there is an urgent need for concerted and comprehensive research to investigate the multiple array of issues involved in the environmental deterioration of African drylands and river basins. The nature, magnitude and extent of environmental degradation needs to be accurately assessed. Empirical investigations are required to determine the specific agents involved, the areas affected and the magnitude of the damage caused and its impact on households and communities.

The pastoral subsistence economy is highly vulnerable to drought. Drought when it occurs creates a shortage of available moisture for plant growth and limits rangeland productivity. Since the use of supplementary feeds is limited, lack of nutritious forage results in high livestock mortality. As a result of livestock loss and total improverishment of nomadic families, dependence on famine relief food by a population which traditionally has been self-reliant has increased. Research is needed into the effects of drought on pastoralism.

Another important area of research is the rehabilitation of degraded arid lands. Research and experiments like the one carried out by IPAL/KALRES in Kenya (UNESCO, 1988) need to be designed to study the phenomenon of rehabilitation of degraded lands around settlement modes and other areas in African drylands and river basins as well as finding an-

swers to several questions (Darkoh 1992a), such as:

- Is it possible to halt the process of desertification around these centres through management intervention?
- Is it possible for these degraded centres to be rehabilitated through full participation by the pastoralists and without the need for costly external inputs?
- What are the stages involved in this rehabilitation and how long does it take (secondary succession)?
- What are the costs and benefits of rehabilitation?
- What is the opportunity cost of capital in such ventures?
- To what extent can ecological principles be applied to degraded areas to restore ecological stability?
- What kind of managerial expertise is needed to achieve the objectives of restoration of degraded arid and semi-arid ecosystems?

Another theme worthy of investigation is the question of dryland pastoral resources, survival and coping strategies and development planning interventions. It would be useful to understand the dynamics of pastoral economies, resource distribution, ecological potentials/constraints, and the effects of development interventions on accessibility to pastoral resources on the communities concerned. It is currently argued that the pastoralists have a wealth of indigenous technical knowledge (ITK) that can be tapped to enhance the development of these drylands. However, we need to know from research the nature of this ITK and at what point in ITK and pastoral economies outside intervention should come in. The failure of development interventions in Africa's drylands needs investigation.

African drylands are witnessing a rapid increase in human population and it is worth investigating the changing demographic patterns and their impact on resource utilization. Another issue is the changing land tenure and utilization systems and their effects on access to pastoral resources.

The socio-economic and land use conflicts and their effects on different sectors of the economy, environment and population in river basins and possible ways of resolving these conflicts constitute another important area of social science research. Also important are the performance and impact of small and large scale development projects especially on small producers, pastoral and agro-pastoral communities.

Finally, it has been shown that deforestation is rampant in African drylands and river basins. There is a need to carry out forestry research into aspects such as natural forestry conservation and management. Research in this field can lead to a better understanding of ecological processes, of diversity and of economically useful lesser known wood and non-wood products. Also essential is research on silvicultural practices that will permit sustainable extraction of wood and wood products not otherwise preserved as protected areas. Such research should aim at developing strategies for protection and sustainable management of natural forests. Other areas of forestry that require resarch include trees in farming and pastoral systems, investigations into tree breeding and intensive forestry, improved utilization - including improved recovery and processing of traditionsl wood products, better use of wood in housing and improved cooking stoves and charcoal kilns (Buckman, 1990/3)

Research on policy and socio-economic analysis also needs to be undertaken inside as well as outside the forestry sector as it addresses questions that foster or hinder sound forestry practices. Examples of possible socio-economic and policy-related research concerned with forestry include studies of property rights and land tenure, culture and gender issues involved in conservation and land use, marketing and the effects of tariff and pricing policies and forest products, institutional capacities to carry forestry programmes and the legal and regulatory setting for forestry. Properly done, these studies could have a rapid and profound impacts on forestry. They can also provide an important avenue for forestry to link up with other land-use/economic and institutional sectors in the search for intersectoral solutions to problems affecting the sustainable utilization of tropical forest resources.

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Environmental and Socio-Economic Effects of Irrigation Schemes in the Arab Near East

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Importance of irrigation for Arid Land Development in Countries of the Arab Near East

Development of a surface irrigation system. Iodar area in Yemen, UNEP/ AGFUND project. Photo: Leonid Kroumkatchev, UNEP.

The fundamental characteristic of the climate in the greater part of the Near East Arab countries is a low rainfall with irregular patterns within and between years. Therefore, the basic ecological factor for agricultural and rural development is water, especially if we take into consideration that 79 per cent of the total area of the region receives less than 100 mm of rainfall per year.

Irrigation has a major role to play in developing agricultural, pastoral and forest production in the region and consequently, contributing to economic and social development.

It provides the most productive basis for agriculture is vital to crop production in arid and semi-arid areas of the region.

Compared with rainfed agriculture, efficient irrigation can lead to a six-fold increase in yields of cereals and a four-to-five-fold increase in root crops. Irrigation can, therefore, be expected to play a critical role in satisfying the food requirements of the region which are under severe strain from high population growth and severe deterioration of the environment.

Irrigation increases the efficiency of cropping systems and diminishes the risk of desertification. The planting of trees and a more consistent vegetation cover replaces the fallow system and the open and exposed landscape characteristic of drylands. Irrigation provides water which can be used to reclaim desert lands, whether by supporting a plant cover or by the leaching of salinized soils.

Irrigation systems, as well as enabling the production of cash crops, serve as important economic centres in arid lands. They provide a basis for dense settlement and related social amenities in regions that once supported sparce populations. As such, irrigated lands can be used for resettlement programmes that desertification elsewhere sometimes makes necessary.

Irrigation could play a major role in developing forests in arid zones, which have poor tree cover. Trees improve the environment, produce wood, help make the land more productive, and beautify the landscape as well as combat desertification.

With irrigation, planting fast growing trees such as poplars, particularly Populus alba f. roumi and Populus nigra f. hamoui, and babylon could play an important role in producing wood to satisfy the growing needs of the region. In fact, poplars are planted in the Euphrates irrigation schemes in Syria in wood lots with trees spaced 6 x 6m with an expected yield of 20 to 30 cubic meters per hectare/year of industrial wood. Branches and leaves derived from thinning are used as firewood and forage.

These large plantations also contribute to decreasing wind speed, and reducing dust on adjacent lands.

Irrigation provides the possibility of establishing windbeaks for the protection of agricultural fields and shelterbelts for the protection of large areas such as villages, small towns, etc. In the irrigation schemes of the Euphrates basin in Syria and Iraq, windbreaks and shelterbelts have proven to be very effective in increasing crop yields, protecting soil from erosion, producing wood and improving the microclimate. The main species used are: Populus nigra f. hamoui, and f. babylon, *Cu*pressus sempervirens var. pyramidalis and var. horizontalis.

Trees could be planted along irrigation and drainage canals and along lakes in order to protect and utilize the margin. These trees also provide shade, reduce wind across the waterway and contribute directly to wood production if properly managed.

Areas along roads and paths are often available for planting trees and shrubs in order to provide shade, reduce dust, conserve the soil and beautify the landscape. The main species used are: Pinus halepensis, Pinus brutia, Cupressus sempervirens, Cupressus arizonica, Eleagnus angustifolia, Nerium oleander, Eucalyptus camaldulensis.

Irrigation has encouraged people to plant trees around houses and home compounds in public places. This type of plantation has contributed to greening the region, improving the environment and combating desertification.

Environmental and Socio-economic Effects of Irrigation Schemes

The long history of irrigated agriculture in the region, particularly on the plains of the Euphrates and Tigris rivers, has not always recorded success. Some past schemes-and some very recent ones in the Arab Near East region suffered severe deterioration through salinization and waterlogging. A number were adversely affected by social and political changes or by silting. Some were adversely affected by social and political changes or by silting. Some proved uneconomical. In others, farmers abandoned their land or never felt at home in their new setting.

The spread of irrigation in the Arab Near East region can be justified from the point of view of economic necessity and betterment, but it can also carry with it human health hazards.

Irrigation is often a costly, technically complex procedure that requires skilled management and sound experience if its full advantages are to be realized.

Furthermore, it may give rise to changes in the major ecosystems regimes; soil, water and atmosphere, and may introduce unwanted effects leading to desertification unless appropriate precautions are incorporated into the system.

Essentially, irrigation interferes with the soil regime by introducing moisture of a certain quantity and sometimes quality which consequently modifies the ecosystem.

The ecological changes provide favourable conditions for the establishment of foreign species, including the vectors of malaria and schistosomasis, which carry with them new problems. It is on record that the percentage of one population infected with schistosomiasis increased from (2 per cent) to (75 per cent) when perennial irrigation was introduced (Obeng, 1977). Interference with the hydrologic cycle may cause waterlogging which, with the deposition of salts, may defeat the entire purpose of irrigation.

Fortunately, however, as may be said of most development projects which produce environmental hazards, timely precautions may minimize such undesirable effects.

Emphasis should be placed on how to get the best out of the potential benefits of irrigation in arid and semi-arid zones in the Near East and to ensure their sustainability, as well as overcoming the detrimental effects on the environment and particularly, on man himself who is an integral part of the environment.

Impact of Irrigation on Soil and Water Regimes

The ultimate goal of irrigation is to maintain an optimal soil moisture content in the root zone to ensure high crop yields. The soil root zone is the heart of the terrestrial part of the hydrological cycle Modification of the soil moisture content due to irrigation may considerably alter the hydrological cycle both quantitatively and qualitatively. The conditions prevailing in this relatively thin layer determine the ways in which precipitation, having reached the land surface, either returns directly to the atmosphere, creates surface runoff, or infiltrates.

The hydrological changes caused by irrigation are not always local problems but they may influence large areas interconnected by the hydrological cycle. Investigations have to be extended to large regions and, especially within the Euphrates river basin through multilateral efforts of the interested countries: Turkey, Syria and Iraq.

The changes that can be expected from alterations of the moisture content of the root zone due to arid land irrigation are as follows:

(a) Modification of the atmospheric branch of the cycle
- Increase of actual evapotranspiration;
- High atmospheric vapour content.

The increase in evaporation due to irrigation is limited. The total amount of water evaporated and transpired cannot be higher than the potential evapotranspiration (taking into account the oasis effect) and provides a relatively small amount of vapour related to the moisture transported by the air masses. This is the reason why only insignificant changes are expected in the total amount

and pattern of precipitation as a result of irrigation.

For planning and design, the difference between potential and actual evapotranspiration has to be calculated.

(b) Modification of surface runoff

- Increase in amount and intensity of catchment runoff resulting in higher erosion potential and greater sediment transport;
- Control of river discharge by reservoirs, and a decrease in the amount of solids transported in streams because of reservoir retention. This can result in a deterioration of river beds because of the smaller sediment transporting capacity. The settling of suspended load in reservoirs causes not only a decrease of available storage capacity, but it also removes some plant nutrients from the water as has been observed in lake Al Assad in the Euphrates basin.

(c) Modification of the groundwater regime, migration of salts and of the hydrological processes in soil moisture.

- Rise of the water table below irrigated lands;
- Development of horizontal groundwater flow from irrigated area towards the neighbouring non-irrigated lands, raising the water table of the latter and the development of a "dry-drainage area";
- Leaching of the irrigated soils, transport of salts by groundwater flow and the acceleration of salt accumulation under the dry drainage areas.

(d) Modification of water quality other than that occurring within the soil moisture zone

- Increase in salt concentration during storage, conveyance and distribution of water due to evaporation;
- Other qualitative changes occurring during these operations, including change in temperature and suspended load; pollution caused by nutrients and pesticides from surface runoff and by salts transported by water percolating into the canals; deterioration of the quality of the water downstream caused by the effluent of the drainage systems which has a high salt content.

Establishment of windbreaks along the irrigated perimeter in the Lodar project Area, Yemen. Photo: Leonid Kroumkatchev, UNEP.

Among the qualitative changes, increase in salt content of the effluent water is the most serious. The Euphrates is an example where the increasing salt content raises international concern.

Special attention should be given to eutrophication of waters due to fertilizer applied on cultivated lands. Surface runoff may carry a large amount of nutrients, both phosphates and nitrates, into rivers and lakes. Pollution from fertilizers can be avoided only by applying special farming practices.

In some instances the extraction of water from underground aquifers may include undesirable intrusions of sea water of connate brines into the aquifers which, over a period of time, can cause the quality of the water in the wells in the intrusion path to deteriorate and become unsuitable for domestic, industrial, or ir-

rigation purposes. The deterioration is usually gradual. Reduction in pumping drafts, artificial recharge of imported water by injection wells, or the use of barrier injection or withdrawal wells, are methods which have been used successfully to halt, and in some cases to reverse, the intrusion.

From a practical point of view, failure to apply efficient principles of water management in the irrigated projects in the arid and semi-arid zones will lead to water wastage and hence loss of productivity. Such wastage can occur at any point in the system, through seepage and evaporation during storage, conveyance or distribution or as a result of bad timing in water application, by over-watering or poor techniques of field application.

Seepage, over-watering and inadequate drainage can result in the waterlogging of soils, which reduces productivity through inadequate aeration and its associated salinity, eventually leading to the loss of cultivable lands. This is a problem locally associated with low-lying tracts and areas of heavy soils.

Excess evaporation and transpiration will result in salinization and alkalinization of soils. Where drainage is inadequate, whether natural or artificial, salts accumulate. Salinization and alkalinization become general problems wherever artificially raised water tables, associated with waterlogging, capillary rise or pollution from salinized waterflow, prevent the proper leaching of salts. Salinization also occurs when the irrigation water is too salty. The result can be seen in lowered yields, restrictions in the choice of crops and the final loss of irrigable lands which can only be reclaimed at great expense.

In Wadi-al-Fayd in the Euphrates basin in Syria, it was shown that irrigation alone appeared to be responsible for a rise of the ground water table of about 0.30m per year; rapid rises were due to heavy water losses from canals constructed in coarse soils with high gypsum content. The critical depth of the watertable to avoid concentrations of salts harmful to plants is about 2m, and ait is essential therefore to maintain the water table below this level. The remedy lies in preventing the losses by repairs or reconstruction of the irrigation canals. The hydrological and drainage investigations emphasize the very serious effect of leakage from wadi-al-Fayd's main canal on the ground water table.

Salinity and waterlogging are common problems in the Near East rrigation projects. They are closely related to inefficient water use for irrigation, lack of adequate drainage and poor water quality. The percentage of salt-affected and waterlogged soils already amount to (50 per cent) in the Euphrates Valley in Syria and (30 per cent) in Egypt. In Iraq, it has been estimated that in the year 1950, about (60 per cent) of agricultural lands in the southern Mesopotamia Plains was affected by salinization as a result of improper irrigation and drainage, and (20 to 30 per cent) of these lands become unfit for agriculture and were finally abandoned. It has also been estimated that one percent of the land is lost each year as a result of increasing salinization. In 1970, less than a decade after Jordan initiated agriculture in the Jordan river valley, salt and sogginess were affecting (12 per cent) of the project area, and the extent of the harm was increasing every year.

Some irrigated regions are blessed with adequate natural underground drainage or an efficient flow of surface water out of fields. In Egypt, for example, the annual flooding of the Nile flushed salts out of the soil each year, which is why the Nile valley, in contrast to the Euphrates and Tigris plains, has remained one of the world's most productive and densely populated areas for thousands of years. Egyptian irrigation projects outside the Nile flood plain have, over the last century, developed severe salinity problems. The Aswan Dam, which harnessed the Nile in the 1960s, allows further extensions of the irrigated area, but has eliminated the historic natural soil desalinization process of the Nile valley.

Improper watering, inappropriate tillage of moist soils and the leaching of soils containing gypsum can lead to a deterioration of soil structure and compaction. This results in poor aeration, reduced transmission of irrigation water and finally to lowered yields.

Irrigation calls for particular skills in the application of water and the tillage of watered soils if its great potential for increased productivity is to be developed and sustained. The efficiency of irrigation schemes rests in the last anlaysis on the individual cultivator.

Problems also arise from over-exploitation of limited groundwater in the arid and semi-arid zones in the region. As water is used up, shallow sources may be abandoned, and pumping becomes increasingly expensive as draw-down effects marginal wells. Where the irrigated area is too extensive, well discharge may be inadequate for both irrigation and leaching. The water table may fall. Less favourably sited wells may become so drained that marginal lands will be abandoned. Heavily exploited water may suffer from an increasing accumulation of salts through recharge by salinized water, thus aggravating the problem of soil salinization (Syria, Jordan, Iraq, Bahrain, etc). Sea water may encroach on aquifers that are intensely exploited in coastal drylands (Bahrain, the United Arab Emirates, etc).

It has been proven in the irrigation projects in the region that insufficient provision for drainage in irrigated lands is one aspect of a larger problem plaguing irrigation development. Opening the initial stages of a project such as a dam or major canal is always a prestigious event. But the extra steps required to make the grand projects meaningful and sustainable - the development of systems to deliver water on time and in proper quantities to the individual farmers, and the assurance of proper drainage at the farm level - are often overlooked. These steps are more difficult, requiring the cooperation not only of a few highly skilled technicians, but of all those who are involved in the project. This cooperation is highly needed in the region in order to avoid land degradation and desertification.

Impact of Irrigation on Aquatic Ecosystems

Large irrigation projects in arid and semi-arid lands cause serious ecological changes such as: (a) creation of new ecological systems related to water bodies (reservoirs, irrigation canals, drainage ditches, etc.) and; (b) radical modification of the terrestrial ecosystems. The latter is related to practices of irrigation, ploughing, farming, etc.

Man-made lakes, irrigation canals and drainage ditches and lakes into which drains flow become perennial water bodies that provide media for types of aquatic life that are alien to the arid lands. These changes should be taken into consideration by the planner before the implementation of the projects.

Canals and distribution systems, which are rich in organic matter and nutrients, if unsatisfactorily maintained, are invaded and sometimes choked by dense growth of algae and aquatic weeds.

In Iraq, when irrigation was introduced in the Great Mussayeb projects in the early 1970s, the growth of many hydrophyllous plants, including TyphaPhragmites communis, angustata, and Cyperus rotundus was observed along the canals and ditches. As the irrigation and drainage networks deteriorated during the early phase of operation, this plant growth increased, sometimes even blocking canal water flow. Changes in the aquatic weeds in the Nile and associated irrigation systems in Egypt have followed construction of the Aswan dam. In 1964, water hyacinth suddenly became a serious problem.

However, in certain conditions, the presence of aquatic plants may confer some benefits, some serve as food for fish when alive, and protection for fish fry and invertebrates which are essential for the ecological balance of the medium. The association of aquatic plants with the spread of certain vectors of disease in man and animals is perhaps the main cause for concern over their unwelcome presence in irrigation systems.

The problem of aquatic weeds in irrigation systems should be seen as an ecological response of the environment to the manipulation of hydrological resources by making in the arid and semi-arid zones. It is a problem which requires an interdisciplinary approach if it is to be rationally and satisfactorily solved. The need for cooperation between aquatic biologists, hydrologists, engineers, economists and agriculturists in all stages of planning, implementation and management of irrigation systems is essential, and methods to deal with potential and actual aquatic problems must be incorporated in all planning and management proposals.

Although weeds are not obligatory to the establishment of Bulinus and Biomphalaria which are intermediate hosts for schistosomiasis (or bilharziosis) for example, the snails tend to flourish under their protection and support. Modification of aquatic ecosystems may also increase disease-transmitting mosquitoes.

Impact of Irrigation on Natural Vegetation and Wild Fauna

The introduction of irrigation in arid and semi-arid zones causes disturbs in the natural vegetation, flora and fauna. In the Great Mussayeb project in Iraq, before the introduction of irrigation, the natural vegetation and wild fauna used to live in a balanced ecosystem typical of arid lands. The natural vegetation was of secondary origin, particularly halophytic communities, mostly chenopods. Thorny shrubs were also commonly found in cultivated lands. This vegetation served as habitat for many wild animals, such as wild pigs, hyaenas, rabbits, foxes and wolves. The ecosystem's secondary producers and consumers were equally well adjusted. When irrigation was introduced the majority of these balanced ecosystems were disturbed. Hydrophyllous plants increased, sometimes blocking canal water flow. A large variety of weed appeared and, uncontrolled by specific measures, soon flourished. The same disturbance affected wild fauna. Wild pig and deer almost completely disappeared. Fowl such as wild duck increased in population. The bird population, including sparrows, pigeons, doves and rooks greatly increased, while other birds such as black kites, and partridges decreased dramatically in number. Some wild birds such as falcons almost disappeared from the area.

Reptiles decreased in number. The same changes in natural vegetation and wild fauna has been observed in Egypt after the construction of the Aswan High Dam (Imam, 1977; Mahir Ali, 1977).

In Egypt, unpleasant changes appeared after the construction of the High Dam. Some of the perennial weeds, such as Cynodon dactyn, Cyperus rotundus, and Convolvulus are now very common. There is a noticeable increase in the number of gazelle herds, ibex and barbary sheep. There is also an increase in some economic insect pests, like the grape moth (Polychrosis botrana) and the corn stalk borer (Chiro agamemnon). Cotton leafworm (Spodoptera littoralls) numbers are also on the rise.

In Egypt, M. S. El Abyad, 1977, demonstrated that irrigation had a great effect on the microbial populations of desert soils. The same effects of irrigation and soil fauna has been demonstrated by S. I. Ghabbour, 1977.

In the irrigation schemes, efforts should be made to preserve and propagate beneficial flora. In executing schemes for the drainage of wetlands, due care should be given to the preservation of waterfowl habitats. In preparing land use policies due attention needs to be given to wildlife conservation.

Impact of Irrigation on Public Health

The establishment of an irrigation scheme may render a region more vulnerable to certain diseases. Water can carry toxic chemicals and many communicable diseases, serving both as a transfer medium and as a habitat for vectors and intermediate hosts. Very often, the negative aspects of irrigation are not related to irrigation itself, but to its misuse, and they may be avoided or alleviated by appropriate management.

In the irrigation projects in Syria and Iraq it has been demonstrated that the transmission of water related diseases, such as schistosomiasis (bilharziosis), leyshmaniasis, malaria and typhoid fever, are facilitated by water mismanagement which results in the formation of stagnant pools. Lack of adequate water supplies and poor sanitation in areas of dense settlement having irrigation schemes are associated with typhoid fever and interstinal parasites that give rise to chronic ill health and labour inefficiency.

Diseases transmitted by water are many, but three emerge as posing serious public health problems: namely, malaria, schistosomiasis and leyshmaniasis. In order to make irrigation undertakings successful and fully beneficial to the people in the region, close collaboration be-

tween irrigation and health authorities should be established as early as possible during the project's formulation stage.

Socio-Economic Impact of Irrigation

Many irrigation schemes in the region are faced with socio-economic problems which arise from the demand for skilled farming, high investment of labour and capital and dense populations.

The 'Great Mussayeb Project' on the Euphrates river in Iraq has demonstrared that sociological problems in irrigation schemes are more difficult and urgent than the technical matters. The adoption of a system which relies on the combined presence of special managerial skills, a well organized administration, teams of engineers, researchers, economists, technicians, and social workers, and last but not least a farmer population receptive to new methods and advice, often means a complete change in life style for technical personnel as well as for the farmer population.

The experience gained in the Euphrates project in Syria suggests a qualitative and quantitative improvement in the extension service as this is a critical link in the success of the programme for obtaining increased agricultural production.

The efforts in this field are unlikely to lead to satisfactory results if they are not backed up by a satisfactory credit and marketing system. An in-depth study of social conditions and constraints related to the implementation of modern agriculture schemes in areas with predominantly traditional farming populations might therefore contribute to solving a number of outstanding problems.

In the Mussayeb project settlers built mud houses on their own farm units and as these structures were naturally better adapted to the climate and to the local life-style, most of the stone houses built by the government were left unoccupied. This rejection of the government housing was due particularly, to the following: they lacked the intimacy found in the traditional houses; the houses were small; the design was too modern for the very traditional population and the houses were too far from the farms.

The experience gained in the Arab Near East region from irrigated agriculture suggest the need for agricultural extension services and demonstration farms, cooperatives schemes to assist with purchasing, marketing and capital loans, ancillary agricultural activities such as poultry or livestock farming to increase income, and amenities and services appropriate to close settlement, including schools, health services and housing. Alternative employment, such as agriculture-based industries, are also required as populations increase.

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Learning from the Nomads: Resource and Risk Management of Nomadic Pastoralists

The East-Pokot in Kenya

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Introduction

Nomadic pastoralists have been living in dryland areas all over the world for many years. These areas are mostly open grassland called savannas or steppes. The steppes are situated outside the tropics and cover a greater area than the tropical savannas. Typical to both dryland types is the semi-arid or arid climate which is characterized by low annual precipitation rates and by the occurrence of rainy and dry seasons during the year.

Nomadic pastoralism is prevalent in these drylands because nomads are able to adapt to changing environmental conditions through migration. This response to such situations is the most important traditional survival strategy in risky environments where dry years and droughts are common scourges. The nomads' mobility is indicative of the flexibility found in every aspect of their lives.

However, prior discussions about the causes of desertification in Africa's drylands used to focus on nomadic pastoralists. Nomads continue to be accused of destroying their own living space by unnecessary herd accumulation and uncontrolled range management. But why should a productive system which has proved to be efficient and economic for centuries turn out to be irrational and useless today? The real problem lies in the changed conditions which decrease the efficiency of traditional strategies (Baum and Reckers 1992).

This article contributes concise arguments for traditional range management using the example of the East-Pokot in northwest Kenya. I spent eight months in the Pokot area to study their way of life, their environmental and economic behaviour, their migration circles as well as their ecological setting. My studies in 1989/1990 comprised vegetation assessments and interviews with elders and women as well as the mapping of diverse geographical aspects (water sources, soils, vegetation, climate etc.).

The results of my studies demonstrate the fact that people living traditional lives are indeed aware of their environment and adapt very well to the prevailing ecological conditions. Their behaviour is not irrational at all. In fact, they have a great interest in conserving their environment. And if the carrying capacity of their living space is overstressed the reason for that arises from externally caused changes (like an increase in population numbers, migration from high potential areas to low potential areas etc.).

The Pokot Area

The East-Pokot are nomadic pastoralists living in the northern part of the Rift Valley in Kenya. The area is a young volcanic zone with fertile soils. While this fact has a bearing on the carrying capacity of the area, lack of water is the restrictive factor for the growth of vegetation (Reckers 1990). The semi-arid climate with a mean annual rainfall of about 600mm per year is characterized by highly variable rainfall patterns. The vegetation typical of the area is thorn-savanna with drought-resistant plants prevailing. (Kumu and Reckers1990).

The East-Pokot live in an area comprising approximately 4,400 km2. But they migrate much further afield in dry years andtransgress borders to other pastoral areas. This has already resulted in ethnic conflicts (Bollig 1992).

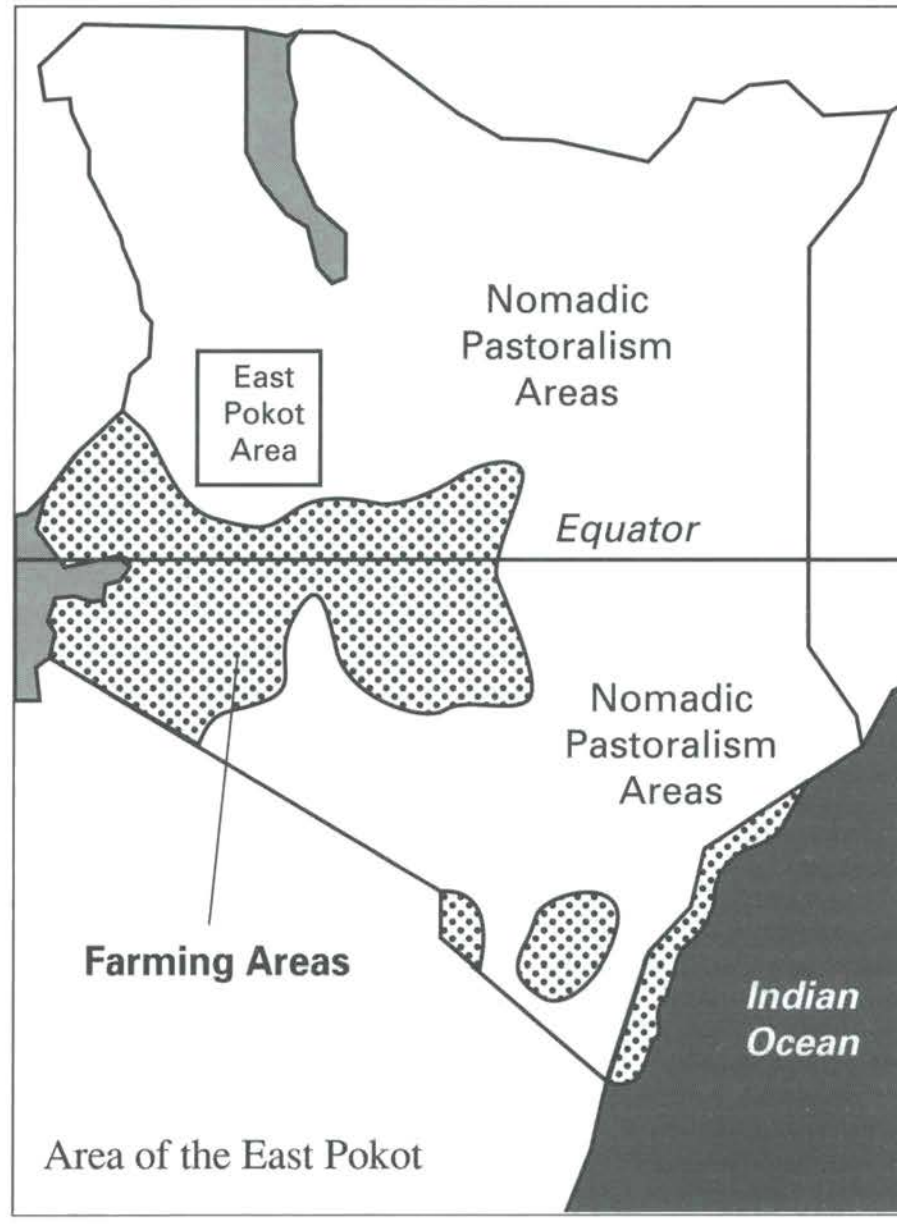
Economy of Pastoralism

The East-Pokot's lifestyle is very traditional. Their most important income source and form of economy is extensive livestock breeding. In some places this is supplemented by a little rainfed agriculture or honey production. But these activities are of little significance when compared with animal production.

Their production basis is the natural pasture which can be divided into two quite differently composed rangeland areas: the rainy-season grazing grounds in the lowlands (800-1000m above sea level) and the dry-season pastures of the highlands (1000-2500m above sea level). (Reckers 1991).

Their basis for subsistence is the herd which is composed of cattle, goats, sheep, donkeys and sometimes camels. The average Pokot household owns 15 to 30 head of cattle, 30 to 50 goats and sheep and 2 to 3 camels (if any). The animals are not only very important for maintaining their social network (e.g. bride-price, livestock presents, livestock loans and ritual slaughter for festive occasions). Llivestock also contributes to their relative economical independence. For a few years now livestock markets have been set up in the region where herd owners can sell livestock.

The East-Pokot rely on the herds' products. Milk plays the most important role and very often it is the only food during the rainy season. During the dry season the milk production especially of the cattle decreases considerably. At this time the main milk sources are the camels and goats. Maize which is exchanged for livestock before the dry season now represents the most important food, sometimes complemented by goats' meat. Cattle and camels are rarely slaughtered. Normally they only leave the household for the payment of the bride price, livestock offerings to relatives or as sacrifices for ceremonies or rituals (Bollig and Reckers 1991).



Mobility as survival strategy

The following are some survival strategies practised by the East-Pokot.(compare Reckers 1992b & 1993b).

Herd Accumulation

In connection with herd accumulation the term "cattle complex" (Herskovits 1926) is often applied to explain the alleged over large herds. However, from the point of view of a nomad it is understandable and reasonable to strive for a huge herd. The nomad's herd is more than capital. Far more important is its role as "risk capital" when it is used in times of need like droughts or epidemics of livestock diseases which can decrease the herd size considerably in a short time.

Despite the prevailing opinion that traditional herd management leads to over-aged herds this cannot be said of the East-Pokot. Bulls run with the herd for no longer than six years, cows only as long as they are reproductive.

Herd Diversity

The diversity of herd stocks allows a more efficient use of the rangelands and facilitates a more reliable supply of food. Mixed stock do not compete over fodder. While cattle mainly depend on grass, camels and goats prefer bushes especially the thorny acacias which are available all the year round in the lowlands in contrast to grasses.

Other advantages are the diverse attributes of the animals: camels and goats for example are more drought resistant than cattle and give milk even in dry periods. The long lactation period of camels translates into a year long milk source. A cow on the other hand can produce ten times more milk on good grazing grounds than a goat. Another advantage of cattle compared with camels is their higher reproduction rate. While camels can have calves every two years cattle are able to reproduce every year, and goats twice a year. Every species has its advantages and disadvantages. A decisive survival factor of diversified herd stocks is the difference in their food and water demands (Reckers 1991a).

The goat is of particular importance. Despite the fact that goats are accused of being the main damaging factor for the

ecology of drylands they can save a nomadic family from economic ruin when droughts or epidemics have caused drastic cattle losses. Their faster reproduction rates relative to camels and cattle permit quick cash sales or livestock exchanges which can be used to acquire large stock, thus rehabilitating the cattle herd (Schwartz 1986).

That is why despite the cultural preference for cattle, goats and sheep are numerically more important.

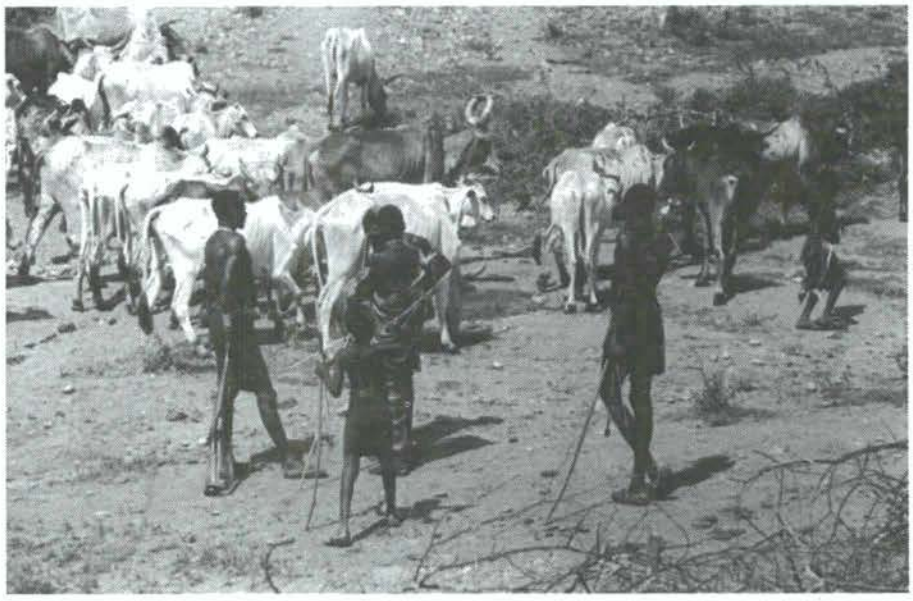
Herd Dispersion

Dispersion means the temporary or long-term scattering of herd stocks. The system of "cattle friendships" facilitates a permanent exchange of parts of the herd through livestock loans. Livestock loans strengthen relationships among nomadic pastoralists and insure their social security system. The East-Pokot disperse their herds among herd owners who live great distances from each other. Another form of dispersion is the distribution of parts of the herd to different dry season rangelands.

All these different forms of dispersion reduce the risk of losing the whole herd at any one time through droughts, epidemics or cattle raids, e.g. by the neighboring and traditionally hostile Turkana nomads (Bollig 1992).

Seasonal Mobility

The rangelands of the East-Pokot are communal. The grazing system is characterized by seasonal migration of cattle herds to the dry-season grazing grounds. During the dry period from October to April the young herdsmen guide their herds to the grasslands in the highlands which are conserved for the dry-season. The herdsmen aged 12 to 16 years are extensively mobile. At the end of the dry season they move their cattle camp every five days. Every two days the cattle herd has to walk to a water site in the lowlands. A few weeks after the first rains the herds return home to the stationary manyattas (family villages) which are situated in the lowlands. The other livestock species do not need to migrate to the dry season rangelands because their fodder demands are less than those of cattle. The grazing areas in the highlands are restricted and preserved during the whole rainy season to let the grass regenerate (Reckers 1993a).



Cattle herding close to a dam. Photo: Heinz Müller, outtec.

The seasonal mobility is a form of adaptivity to harmonize the fodder demands of the different livestock species.

Drought-Related Mobility

The comparison between the migration patterns of the East-Pokot under different climatic conditions shows further adaptive strategies:

- With increasing dryness the migration circles get longer.
- With increasing dryness several grazing areas have to be visited or the herd will be divided into smaller groups.
- The longer the drought the longer the herdsmen stay on the dry-season rangelands, sometimes up to two years. In exceptional cases the small stock accompanies the cattle on their migration to the dry-season grazing grounds, when there is not enough fodder left on the lowland pastures.

Daily Mobility

Every morning the herd owner decides upon a new route for the daily livestock migration. The migration cycle of cattle is longer than the one for the goat and sheep herds. The permanent change of grazing routes is the most ecologically sustainable land use pattern.

Household Shifting

Total household shiftings which took place every two to three months in the early part of thiscentury (Beech 1911) are nowadays undertaken about every five years. The reasons are - inter alia - mostly the reduction of rangeland quality or the availability of water in the vicinity of the manyatta.

Range Management

The range management of nomadic pastoralists is closely related to environmental management because their environment consists mainly of natural pastures. Certain measures serve as resource control and intentional environment management (Reckers 1992a and 1992b, Schwartz 1986, Walther 1987).

Pastoralists have often been accused of mismanaging their environment. This reproach can be disproved.

Range management among the East-Pokot means the regulation of rangeland use on a regional and neighboring level. The determination of rainy-season and dry-season grazing grounds as well as of those rangelands limited to certain animals of a herd (e.g. lactating cows and calves) are the most important rules in this regard. In times of need the migration

routes are expanded respectively. This kind of strategy strives to ensure an even use of pastures. The dry season pastures get time to regenerate. Regulated grazing prevents land degradation ("desertification") and excessive re-growth of bushes ("green desertification") which makes pastures impassable (Conant 1982).

Bush control as a means of conserving grazing grounds may also be a result of regulated burning. But this occurs rarely nowadays due to the official prohibition and due to lack of grass. The reasons for burning (with positive effect) are elimination of bushes, promotion of fresh grass and the fight against tse-tse flies and ticks.

The elders of each community are the controlling institution concerning all range management affairs. Under a large shady tree, the daily meeting place of the elders ("kokwo"), all important communal grazing regulations are decided. Certain "unwritten" rules are valid for the whole East-Pokot area, e.g. the restriction to migrate to the dry-season grazing grounds during the rainy-season (Reckers 1992a & 1993a).

Water Management

Water resource control is also a measure to conserve an important resource. Restriction on water use is stricter when water availability is scarce.In general, the East-Pokot do not prohibit the use of water from dams, rivers, springs or wells. They even tolerate the use of their dams by outsiders like the Tugen,the Chamus or Turkana as long as they comply with certain rules: they first have to ask the elders for permission and finally sacrifice an oxen which will be commonly consumed. Sometimes an additional contribution is due.

Under certain circumstances the East-Pokot lay down a temporary restriction on the use of dams or a restriction specific to certain livestock species. If there are other water sources like rivers nearby, some communities will close their dams. In case of water scarcity towards the end of the dry season (often in January or February) the use of dams is limited to small stock and family members. The cattle and camels are moved to distant water sources (Reckers 1992a & 1993a).

Both rules are preventative measures to extend the time of sufficient water availability. Again the council of elders decides all the relevant rules in the kokwo.

Plant Use

The East-Pokot possess an immense plant knowledge. Every child is able to term and identify plants and knows their value in terms of human and animal consumption. The different possibilities of plant usage in this area are described in detail in Timberlake (1987).

In times of need and on the dry season grazing grounds this knowledge on plant usage is used Certain leaves are collected as a substitute for tea, other plants serve as vegetables. Fruits of wild plants are also part of the diet but they are rarely collected systematically.

The East-Pokot know a lot of medicinal plants. Some of them are used for veterinary purposes.

Wood is selected specifically for a certain purpose. The East-Pokot, for example, prefer the hard wood of the Boscia coriac*ea* or the termite resistant wood of the *Terminalia spinosa* for the main post of their huts. For the hut frame they use the branches of different Acacia species and certain grass species for thatching. The fence of a *kraal* consists of densely arranged Acacia bushes. Firewood - preferably the prevailing Acacia wood - is collected not cut (Reckers 1992a).

Livestock Marketing

The seasonality of the life of the East-Pokot is reflected in livestock marketing. During the dry season the supply of livestock on the market increases. The increased supply and the simultaneously shrinking demand lead to very low prices.

This market response has a serious effect in times of drought. The drier the season the weaker and more prone to disease the livestock will be. Purchasers are hardly interested in livestock of such low quality, perhaps only for a dumping price. Exactly at the moment when the pastoralsists' willingness to sell is highest the market is overstocked with low quality livestock and selling livestock becomes barely profitable. However, the East-Pokot sell more livestock during the dry season than during the wet season. During the dry season the sale of hides and skins increases as well because more meat is consumed as a compensation for the sparse milk supply and more debilitated animals have to be slaughtered (Reckers 1992a).

Another reason for forced sale are epidemics among livestock. An outbreak of an epidemic, causing a sudden oversupply of a certain species, can adversely affect livestock prices, especially when it occurs during the dry season.

The Present Crisis of the Nomads

The enumeration of all the survival strategies might not be complete but at least it gives us a rough idea of how the East-Pokot cope with the risks of their environment. Their strategies are in the first place determined by the climate. The strategies are in harmony with the yearly cycle of rainy and dry seasons and are modified when needed: e.g. by expansion or shifting. In this way menacing situations are controlled.

Up to now the mechanisms to manage crises and minimize risks have functioned reliably. But in the recent past the East-Pokots' traditional survival strategies have become less effective which they were made to realize for the first time during the last extreme drought in 1984. They suffered from a serious shortage of food and livestock losses were high. Since then the problem of over-grazed areashas become apparent and shifting to grazing areas adjacent to their territory becomes more and more impossible due to the expansion of agricultural activities in neighbouring districts. Only towards West Pokot district are there possibilities of expanding migration routes without fear of violent conflicts. As the East and West Pokot belong to the same ethnic group the West Pokot tolerate the presence of the East-Pokot during times of need.

Traditional nomadic pastoralism has apparently reached its limit. The difficulties, however, are neither due to the traditional nomadic system itself nor to environmental changes or climatic fluctuations. The problems have been caused by external factors which the East-

Women talk under a shady tree in a manyatta. Photo: Heinz Müller, outtec.

Pokot did not cause and cannot influence.

The biggest problem is possibly population pressure from the southern regions and central regions into the semi-arid areas of Kenya. This causes land scarcity followed by over-exploitation and degradation of the natural resources. Consequently, the traditional strategies cannot be applied to the fullest and necessary extent. For example, a flexible expansion of grazing grounds is no longer possible.. A further external factor is the national economy of Kenya. It does not offer much incentive for the nomads to sell livestock and therefore fails to halt the process of their economic marginalization. Additionally, in connection with the overall changes a transformation of the sociocultural structure and values among the East-Pokot is inevitable. As soon as the present hierarchical social structure according to age-sets will adjust itself more to the principle of power and education, the council of elders, for instance, will loose its traditional controlling function.

Measures for the Future

1. The rangeland scarcity resulting from population pressure urgently demands measures to improve rangeland productivity. This means optimizing and enhancing the economic use of a particular area with respect to the ecological balance. Fixing barriers across the upper reaches of rivers to slow down run-off could be an efficient water catchment measure. Dam sites should be well discussed with elders and dams in dry season grazing areas should be avoided because they promote overgrazing. At the same time a sufficiently large area of communal rangeland should be guaranteed and, if necessary, an institutional frame established accordingly. Organizations are challenged to tackle the issue of communal land tenure with policy makers.
2. To reinforce the nomadic system it is necessary to generally improve the supply service in the area. For instance, during the dry season, a reliable supply of grain should be guaranteed. The veterinary service must be intensified. Through the establishment of a functional market system under efficient management and incentives for the sale of livestock a full integration of the nomads into the national economy could take place.
3. If development aid would encourage and support the position of the nomadic pastoralists the socio-economic collapse accompanied by its negative consequences of unemployment and impoverishment could be halted. In this context more participation of the nomads in the planning and implementation process of projects would be desirable. Education policy in this respect needs a change and curricula for schools in pastoral areas should be ad-

justed to nomads' needs, e.g. supplemented by lessons on rangeland ecology and veterinary sciences. As long as there are no alternatives to the nomadic system in a semi-arid environment, the development agencies are required to reinvest in the existing traditional nomadic system. But this effort should not just support the romantic imagination of the traditional living nomads. Whether and how an investment into the traditional system is desirable or not very much depends on how viable the system is without any external input. One of the most important questions in this respect is: how seriously do the pastoralists take their adaptive strategies, and last but not least are they themselves willing to retain this lifestyle?

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NEWS FROM UNEP

Outlines of the Implementation of PACD, 1992-1993

The United Nations Conference on Environment and Development (UNCED) Agenda 21, the blueprint for international action to protect environment, highlights land degradation in several chapters most notably in Chapter 12. It emphasizes the global nature of desertification and is a major step forward in gaining international recognition of the need for concerted action worldwide. It challenges the world community by recommending that the General Assembly establish an international convention as well as find the means for the battle against desertification. This is a very special challenge because the problem is of global importance and can only be solved through a global effort and approach and yet the solutions are local.

In 1992/1993 UNEP has actively participated in the work of the Intergovernmental Negotiating Committee for the elaboration of the Convention (INC). The first substantive meeting of INC was hosted by UNEP and held in Nairobi from 24 May to 3 June 1993 (accompanied by a desertification exhibition organized by UNEP). UNEP has also assisted the INC process and the INC Secretariat (with information and finance) to implement the UN Plan of Action to Combat Desertification, financial support of about 0.5 million US dollars for:(i) direct support to the Secretariat; (ii) case studies required in the negotiation process; (iii) regional expert meetings; (iv) participation of NGOs etc.] and through active participation in the International Panel of Experts on Desertification. In May 1993, UNEP funded an Organization of African Unity (OAU) Ad-Hoc Working Group of Experts Meeting on Desertification in Nairobi (assigned the task of drafting Africa's contribution to the elaboration of the International Convention to Combat Desertification); and in August 1993 an OAU Workshop on Common African Strategies for the 2nd INC Meeting.

After UNCED, UNEP with the other members of the Inter-Agency Working Group on Desertification (ref. IAWGD 19, 14-15/9/92), while reviewing the implications of Agenda 21, concluded that Chapter 12, with its six programme areas could appropriately be considered as the new framework for addressing desertification and drought related problems, as it conveniently builds upon the Plan of Action to Combat Desertification (PACD) of the United Nations conference on Desertification (UNCOD) 1977 and agencies are to reorient their ongoing activities according to the new framework.

In 1992-1993 UNEP continued to give strong emphasis to refining the assessment of desertification. At the global, regional and national levels UNEP is currently undertaking several activities:

(i) To understand better the relationship between desertification and climate fluctuations, UNEP, with the World Meteorological Organization (WMO), initiated a study on the interactions of desertification and climate. The first phase of the study was concluded with an expert panel meeting in November 1993 and its report is to be presented to the INC in January 1994. It has three major components: impact of climate change on desertification; impact of desertification on climate; impact of climatic variability, including drought, on desertification.

(ii) The issue of the resilience of soils to withstand desertification and drought is more complicated, as there are no recent findings except for a general notion by some geographers that soils of drylands have appeared more resilient than was previously described. A UNEP co-sponsored International Symposium with the International Society of Soil Scientists (ISSS) on Soil Resilience and Sustainable Land Use concluded that soil science had no established definition and no measurable parameters for soil resilience. ISSS is to place the soil resilience issue on its agenda of scientific research priorities, and UNEP will assist ISSS in organizing a symposium on soil resilience and soil management, to be held in connection with the 15th International Congress of Soil Science in Mexico in 1994.

(iii) For reviewing and assessing the global transboundary impacts of desertification on climate biodiversity and international waters a UNEP/UNDP workshop was organized in October 1992 to assess the eligibility of desertification control programmes to the finances of the Global Environment Facility (GEF).

(iv) For evaluating the methodologies to assess and predict sustainability of land management systems in semi-arid and sub-humid regions UNEP is sponsoring a project undertaken by the Scientific Committee on Environment Problems (SCOPE) of the International Council of Scientific Unions (ICSU). The first on a series of regional workshops was held in Dakar from 15 to 18 November 1993.

(v) Another Dryland Resource Management Project was undertaken by the International Center for Agriculture Research in Dry Areas (ICARDA) with support from UNEP (and OPEC, IDRC and the Ford Foundation) in six North African/West Asian countries to

diagnose and analyze current management practices and indigenous perceptions for achieving sustainable improvements.

(vi) To evaluate and assess the socio-economic aspects of desertification, a workshop "Listening to the People" was organized by UNEP from 14 to 17 December 1993.

(vii) In cooperation with the Economic and Social Commission for Asia and the Pacific ESCAP, FAO and UNDP, UNEP assisted in the preparation of a comprehensive report for the Secretary-General on combating aridity, soil erosion, salinity, water logging, desertification and effects of drought in South Asia, as requested by the Economic and Social Council (ECOSOC). It was presented to the ECOSOC substantive session of 1993.

On methodology development for regional assessment of desertification, UNEP in collaboration with ESCAP and the Arab Centre for the Study of Arid Zones and Drylands (ACSAD) started a project to develop a unified methodological approach for desertification assessment and mapping. In this regard ESCAP, in cooperation with UNEP, organized in November 1992 an expert group meeting in Tehran for the Asia-Pacific and West Asia regions.

On a national scale, assessment of desertification, a methodology development project, was started in December 1993 in Kenya to refine and modify the district scale methodology, developed in a pilot project in 1990, into national/country scale.

For monitoring desertification control efforts, UNEP has started assigning benchmarks and indicators of progress. This is a long-term undertaking to be implemented together with other indicators of global change within the system-wide Earthwatch programme. At present, an intensive worldwide discussion is taking place on the parameters to be monitored and the data to be collected with regard to both the physical changes taking place and the human dimensions. Several international initiatives relevant to the problem of desertification are being pursued globally and regionally, such as the database core project of the International council of Scientific Unions (ICSU), and the World Soil and Terrain Digital Database SOTER) project of UNEP/FAO/International Soil Reference Information Centre.

UNEP's Desertification Control Programme Activity Centre (DC/PAC) is actively participating in the initiatives outlined above, besides developing its own methodologies. The major emphasis during the next biennium will be on establishing an international network of sites for monitoring and assessing ecological and socio-economic changes. This will entail identification of sites or transects in the dryland countries participating in the network as elements of the global Earthwatch programme, with an international coordinating unit and databank. These plans will be appropriately adjusted, once an international convention on desertification and drought has been adopted.

In 1992/1993, UNEP continued to disseminate information on programme results and problems related to desertification control around the world. Issues No. 20, 21, 22 and 23 of the Desertification Control Bulletin were published and distributed, with 4,000 English copies per issue. In addition, on request from libraries, research institutions, UN organizations, universities and individuals, over 5,000 copies of other publications and documents were distributed, including: Desertification Control in Africa, Financing Anti-desertification programmes, Status of Desertification and Implementation of the UN PACD, Combating Desertification in the Southern African region, World Desertification Bibliography, Desertification Revisited and earlier issues of Desertification Control Bulletin.

In 1992, UNEP initiated a project for the worldwide accumulation of data on successful desertification control projects on local or national scale, with a view to disseminating the experience of reliable success stories for replication elsewhere under similar socio-economic and ecological conditions. The database will complement existing data on the extent of desertification in the world and assist in mobilizing the resources needed to combat desertification.

In 1992-1993 UNEP continued to assist member Governments in developing their national plans of action to combat desertification (NPACDs).In a joint undertaking with the Economic and Social Commission for Western Asia (ESCWA) and the FAO, UNEP assisted the Governments of Bahrain, Oman, the United Arab Emirates and Yemen in the preparation of their NPACDs.

Development of NPACD for Chile was initiated in cooperation with FAO. The draft NPACD for Peru, developed by the National Office for Natural Resources Evaluation (ONERN) was subjected to national discussions. UNEP provided consultancy assistance to the Government of Mongolia to finalize the draft NPACD and three project documents for donors' consideration at the NPACD review workshop in 1993. In addition, also as part of the UNEP/ESCAP cooperation, the preparation of Pakistan NPACD started in 1993.

The role of sub-regional organizations in the efficient implementation of the PACD has been underlined by the Administrative Committee on Coordination (ACC). Accordingly, UNEP provided assistance in 1992-1993 to sub-regional organizations such as: Permanent Interstate Committee for Drought Control in the Sahel (CILSS), Intergovernmental Authority on Drought and Development (IGADD), the Southern African Development Community (SADC), the Conference of Arab Ministers Responsible for Environment (CAMRE); the African Deserts and Arid Lands Committee (ADALCO); the Desertification Control Research and Training Network for Asia and the Pacific (DESCONAP):

(i) UNEP assistance to CILSS and IGADD was primarily channelled through the UNEP/UNDP Joint Venture by the United Nations Sudano-Sahelian Office (UNSO).Futhermore, IGADD received direct assistance from UNEP for its project proposal entitled "Greening IGADD sub-region through enhancing the participatory role of youth in Primary and Secondary Schools", to prepare the regional and national components of the project.

(ii) During 1992-93, UNEP supported

the Environment and Land Management Sector Coordination Unit of the SADC to provide assistance to the Kalahari-Namib countries (Botswana, Zimbabwe) for elaborating and developing projects under the Plan of Action for the Kalahari-Namib Region (Integrated land-use planning, rangeland monitoring, protection and rehabilitation).

(iii) Through its Arab League Liaison Office in Cairo, UNEP has been assisting the Secretariat of CAMRE in initiating its priority environmental programmes, which include desertification control. CAMRE, in collaboration with UNEP and the Arab League Educational, Cultural and Scientific Organization (ALECSO), organized a subregional workshop for decision makers on the experiences and future orientations of the Green Belt Project of North Africa (GBPNA).

In 1992-1993 UNEP-DC/PAC also financed holding of three seminars and training courses for participants from the GBPNA project countries:

- "Training seminar on cultivation and development of medicinal and aromatic plants in North Africa" held in Tunisia in October 1992;
- "Training seminar for leaders, planners and experts in desertification control" held in Tunisia in November 1992;
- "Training seminar on Mycorrhiza and their field application in agroforestation programmes in North Africa" held in Cairo in June 1993;

In addition a project "Setting up of a Seed Bank" (to be carried out in 1994) was prepared. The project will assist the Green Belt Project countries to reach self-sufficiency in the field of seeds of the important forest trees and other range plants and by conserving the genetic resources of these important local drought resistant plant species grown naturally in the North African region.

(iv) UNEP's DC/PAC continued to serve as the secretariat for the ADALCO of the african Ministerial Conference on the Environment (AMCEN) and serviced the sixth ADALCO meeting held in Nairobi in 1993. UNEP also assisted ADALCO through the provision of consultancies to carry out two subregional studies: strengthening of the Green Belt Project of North Africa; and development of the Nubian Sandstone Aquifer.

(v) In the framework of a multi-disciplinary programme (RAF/88/047/B/01/5) for strengthening of economic cooperation and integration among West African States, within the Economic Commission for West African States, UNEP has provided assistance in the preparation of a Master Plan for the coordination of Programmes to Combat Desertification in the Economic community of west African states (ECOWAS) sub-region. The draft Master Plan, prepared by DC/PAC, was presented to an Inter-governmental Workshop, financed by UNEP and held in Ouagadougou, Burkina Faso, at the end of 1993.

(vi) In the Asia and the Pacific region, UNEP and UNDP, considering the extent of the problem of desertification and its impact on the land resources and population of the region, have given high priority to the Desertification Control Research and Training Network for Asia and the Pacific (DESCONAP). The third Regional Consultative Meeting and Tripartite Review Meeting of the DESCONAP project was held in Thailand in February 1992, to consider its second phase and the 1992-1993 activities of its Action Plan on Desertification Control in Asia and the Pacific to the Year 2000.

To assess the current status of desertification and existing national policies and programmes on desertification control including institutional set up, UNEP in cooperation with ESCAP initiated in March/April 1992 technical expert missions on assessment and mapping for India and China. With the aim of developing a unified methodological approach for desertification assessment and mapping, in November 1992 ESCAP, in cooperation with UNEP, organized an expert group meeting in Tehran for the Asia-Pacific and West Asia regions hosted by the government of Iran. In 1993 UNEP entered into agreement with the Government of Iran and ESCAP on the establishment of a regional office in Tehran on assessment and mapping desertification in Asia and the Pacific region.

In the field of human capacity building UNEP, in cooperation with Governments and regional training and research institutions, continued to conduct training programmes in combating desertification; to enhance the technical capabilities of desertification-prone countries in tackling desertification and to promote awareness of the threat. During 1992-1993, UNEP, in cooperation with ESCAP, ACSAD, the Instituto Argentino de Investigaciones de las Zonas Aridas (IADIZA), UNEPCOM, the Green Belt Project of North Africa, ALECSO and the Governments of Argentina, China, Egypt, India, Mongolia and the Syrian Arab Republic organized 13 training courses, workshops and seminars.

In support of the Cairo Programme for African Cooperation of the AMCEN, UNEP, with the Institute of Environmental Science of Nanjing, China started training African villagers and technicians in ecological farming in 1990. In October 1992, a training workshop was organized in Nanjing for 20 French-speaking African farmers and technicians from 17 countries.

A total of 312 participants from Africa, Asia and Latin America were trained in the Management of dryland natural resources, sustainable food production, monitoring and assessment of desertification, increased application of new technologies and public information. In keeping with UNEP policy, most of the training for developing countries was organized within the regions concerned: in Argentina, China, Egypt, India, Mongolia, the Syrian Arab Republic and Tunisia. In addition, IAWGD members, namely, UNSO, WMO, ESCAP and the International Institute for Environment and Development (IIED) organized training courses related to desertification control for a total of 3,947 participants from developing countries affected by desertification.

On the financing and other measures in support of the Plan of Action to Combat Desertification, (April 1992), the participants in the GEF decided that land degradation issues, primarily desertification and deforestation (as they related to the priority areas of the Facility), would be eligible for financing by the GEF. UNEP and UNDP organized an expert workshop in Nairobi from 28 to 30 October 1992, to discuss the main global issues raised by desertification/land degradation that have direct relevance to the established objectives of GEF, and to discuss other issues that have global significance, but which do not presently lie within the framework of GEF. In December 1992 the participants in GEF reiterated the earlier decision of 30 April 1992, but did not reach consensus on the workshop recommendations to include land degradation in the GEF as a priority area in its own right.

In line with GC. 16/22 B decision on revising the mandate of the Consultative Group for Desertification Control (DESCON) UNEP took no action towards financing of the PACD and no DESCON session was held in 1992-1993.

The above decision 16/22 B, furthermore invited 'the international community to create the necessary economic and financial conditions that would enable countries prone to desertification to appropriate part of their resources to combat desertification'. Despite the urgent need for action in this field, no country or agency has reported any tangible progress in according high priority to programmes for combating desertification and rehabilitating degraded land. The governments, however, are presently devoting a lot of interest and effort in the INC process (as discussed in paragraph 2) to find mechanisms and long-term solutions for financing desertification control programmes.

Costing Desertification

UNEP has been requested by the UN General Assemby and the international community to make an economic valuation of the costs of dryland degradation and the benefits that would be gained by halting it. These costs and benefits need to be calculated at various scales, ranging from individual projects, national contexts, to the global situation. UNEP has attempted to carry out this exercise on two occasions since the 1977 U.N. Conference on Desertification, in 1984 and in 1992.

The difficulty in evaluating the costs and benefits relating to dryland degradation and rehabilitation has been the lack of appropriate economic theory and method. Traditional economics has no methodology for evaluating environmental variables such as soil conservation, the maintainance a primary forest or watershed, the economic loss of a destroyed forest, and so on. Social costs and benefits are also difficult to evaluate and be given monetary value. This has resulted in a very imprecise estimate of what desertification costs the world economically.

Over the past few years environmental economists have begun developing methods of environmental valuation and accounting which promise to revolutionize the way in which we view economic development in general, and the way in which governments and donor agencies will evaluate whether particular projects and programmes will be funded. DC/PAC feels that these new methods have reached such a stage of development that it is time to begin testing them in real situations. There is still no consensus on which methods are best, but it is time for action and time we found out.

In cooperation with UNEP's Environment and Economics Unit, DC/PAC will participate in a programme to begin applying methods of environmental accounting and evaluation in selected case study situations. This will follow recommendations made by experts who will assemble at a workshop in Nairobi this year. Other UNEP units, such as Oceans and Biodiversity, will also participate in the programme.

The overall objective of the excercise is to be able to provide policy-makers and planners with the appropriate economic tools to be able to make decisions that will result in good dryland management and sustainable development. These tools should also enable UNEP to make a much more accurate assessment of the costs and benefits of dryland degradation and rehabilitation the next time around.

The sixth African Deserts and Arid Lands Committee Meeting

Nairobi, Kenya : 6 to 8 October 1993

African Deserts and Arid Lands Committee (ADALCO) activities

The sixth ADALCO meeting was held at UNEP Headquarters, Nairobi, from 6 to 8 October 1993. The meeting was opened by Mr. W. Franklin G. Cardy, Deputy Assistant Executive Director and Director DC/PAC, who delivered a statement on behalf of the Executive Director, Ms. Elizabeth Dowdeswell. Ms. Maria da Graça de Amorin, Regional Representative and Director of UNEP Regional Office for Africa (ROA) welcomed the participants and expressed some views on the desertification control issue.

The meeting was attended by participants from seven African countries, representatives of United Nations organizations and the Organization of African Unity (OAU).

Many reports were presented by the participants, particularly those designated as ADALCO Focal Points.

The following is a report on the activities achieved by ADALCO since its last meeting held in 1991 in Harare, Zimbabwe.

Background

The African Ministerial Conference on the Environment usually called the Cairo Programme aims at strengthening cooperation between African governments in economic, technical and scientific fields, its main aims being:

- Halting the degradation of the African environment;
- Enhancing the food producing capacity of the continent;
- Achieving self-sufficiency in energy;
- Correcting imbalances between population and resources.

The Conference established five committees to address key areas of environmental concern. The committees will liaise between the conference sessions to assist the Bureau to achieve its functions. The tasks of ADALCO are to assist the Bureau in the implementation and follow up of the priority sub-regional actions of the Cairo Programme.

The General Terms of Reference of ADALCO as endorsed by the Third Session of the African Ministerial Conference on Environment based on the objectives of the 1977 PACD (recommendations 1 through 22 and 25), are the following:

(i) To provide technical assistance for the efficient implementation of the relevant priority sub-regional activities adopted by the Cairo Conference to achieve sustainable economic development;

(ii) To respond to requests from the Governments for consultancy or feasibility studies and to refer them to relevant networks for advice;

(iii) To monitor progress of the implementation of village and pasture projects, to provide advice to the managers of national projects as well as priority sub-regional activities and refer them to the relevant networks and to submit recommendations regarding the implementation and financing of the projects to the Bureau;

(iv) To prepare draft reports on the implementation of regional and sub-regional projects for review by the Bureau before presentation to the Conference;

(v) To assist relevant sub-regional organizations namely IGADD, SADCC and the Interstate Committee of Ministers on Desertification (COMIDES) in the implementation and cooperation of their programmes for desertification control;

(vi) To promote activities and programmes for research, training and exchange of technical staff aimed at developing and disseminating techniques and experiences in the field of desertification control.

ADALCO's main achievements

Since the inception of the Cairo Programme in 1985 and the establishment of the African Deserts and Arid Lands Committee, the achievements and programmes of the Committee are the following:

North Africa

1) In line with its mandate aiming at strengthening the cooperation among African countries, by identifying sub-regional programmes that would be implemented, ADALCO developed the Northeast African Sandstone Aquifer which concerns the four countries, namely; Egypt, Sudan, Libya and Chad so as to utilize its ground water for combating desertification. In 1989, two ADALCO Focal Points and a consultant hired by the Secretariat, drafted a "Master Plan for Development of the Nubian Sandstone Aquifer for Combating Desertification in North East Africa". This document was transmitted to the concerned Governments and to the IGADD Secretariat.

In addition, five project fact sheets have been drafted by the Egyptian Focal Point , a consultant, and three other project fact sheets by the Sudan Focal Point concerning the Egypt / Sudan component of the Nubian Aquifer to combat desertification and submitted to the fourth and then to the fifth ADALCO meetings which had approved them in 1992.

Among its recommendations, the fifth ADALCO meeting had proposed to seek financing to implement these important projects. It was proposed that ADALCO should transmit to the Joint Economic Commission for Africa (ECA)/OAU/UNEP/African Development Bank (ADB) Secretariat a recommendation to include these projects in the overall programme for Africa to be submitted to the United Nations Conference on Environment and Development (UNCED). It was also proposed that a new fund should be established and administered by the ADB within the African Common position at UNCED. But all these action proposals did not lead to concrete positive results.

2) The Green Belt Project of North Africa (GBPNA) which is an ongoing integrated project with the six governments of Egypt, Libya, Algeria, Morocco, Tunisia and Mauritania and ALECSO created in 1977. It aims to coordinate the implementation of anti-desertification activities in member states, with sponsorship and assistance from UNEP.

In 1992 - 1993 UNEP-DC/PAC has financed holding of three seminars and training courses for participants from the project countries.

Concerning activities completed in 1992/93, the GBPNA held the following four training seminars:

(i) Training seminar on "Cultivation and development of medicinal and aromatic plants in North Africa" held in Tunisia in October 1992 attended by all project countries. It was an occasion to present and discuss valuable country reports and scientific papers;

(ii) The "Training seminar for

leaders, planners and experts in desertification control" held in Tunisia in November 1992 which was attended by all project countries, representatives of international organizations, namely; ACSAD, UNESCO, FAO, UNDP and UNEP was very successful. Many scientific lectures related to decertification control in Arab countries were presented and discussed;

(iii) Training seminar on "Mycorrhiza and their field application in agroforestation programmes in North Africa" was held in Cairo in June 1993 and was attended by about 15 specialists from member countries;

(iv) A project proposal regarding "Setting up of a Seed Bank" which will be carried out in 1994 has been approved by UNEP. The project aims at assisting the Green Belt Project countries to reach self-sufficiency in the field of seeds of the important forest trees and other range plants, by collecting and conserving the genetic resources of these important local drought resistant plant species grown naturally in the North African region.

The activities anticipated by the GBPNA in 1994 relate to:

- A research study concerning development and improvement of the *Stipa tinacissima* plant of North Africa;
- Collection and multiplication of native range plant seeds with the cooperation of local populations;
- Holding of a seminar on the oases in the North Africa region.

Since its inception, the GBPNA has produced, with the help of UNEP-DC/PAC, 16 studies on various environmental issues, 11 seminars and 12 training courses aimed at promoting environmental awareness in the region.

During the fifth ADALCO meeting which was held in Harare, some participants suggested that similar projects like the Green Belt Project of North Africa be implemented south of the Sahara and in the Kalahari-Namib desert. Discussions held with Japan in 1992 concerning a project of this kind south of the Sahara should resume during the next biennium in conjunction with concerned bodies: FAO, Committee on Forests and Woodlands (COFOW) etc...

Southern Africa

In line with the objectives aiming at controlling the spread of deserts in the Southern African subregion and at implementing projects for food production, the Zimbabwean Focal Point, with technical input from ADALCO, drafted an "outline of an Action Programme to Combat Desertification and Promote Food Production in the Southern African subregion" which was submitted to the third ADALCO meeting and approved. This document was then submitted to SADCC Secretariat with a view to coordinate with the "Kalahari Namib Region Action Plan" and presented at a Project Formulation Workshop held in Bulawayo, Zimbabwe, in June 1990 co-sponsored by the Zimbabwean Government and UNEP. The Zimbabwean Focal Point presented and distributed at this Workshop a report: "Towards Formulating Projects to Halt Environmental Degradation and Declining Food and Energy Yields in the Southern African region". The fifth ADALCO meeting approved this project.

Funding should be sought during this biennium for the implementation of these projects. In 1993 two new project proposals concerning Zimbabwe and Botswana have been drafted by SADCC and proposed to UNEP-DC/PAC. These project proposals which will be implemented in the framework of the Plan of Action for the Kalahari-Namib region are related to the preparatory phase for the integrated land use planning, rangelands monitoring, protection and rehabilitation in Deddiebarn Manyole in Zimbabwe and four Botswana villages, namely; Tsabong, Rakops, Lephephe and Gomare. Other project proposals aiming at installing or reinforcing existing operational village projects for sustainable food, fuel and fodder production in line with the AMCEN Programme which had been anticipated in the AMCEN Umbrella Project in Angola, Mozambique, Zambia and Namibia, could not be implemented in the present biennium due to war prevailing in some of these countries as well as administrative constraints in others. These project proposals will be implemented in the biennium 1994-1995.

Central Africa

In 1990, in Central Africa, two ADALCO national focal points drafted an Action Programme Against Savanization and Sahelization proposing the harmonization of cooperation in the field of environment in the subregion. The report: Programme of Cooperation Against Savanization and Sahelization in Central Africa Sub-region"was approved by the third ADALCO meeting held in Ouagadougou, Burkina Faso, in 1990.

This report had been formulated in response to the concern expressed by the Central African government and a circular letter from UNEP requesting an assessment of the progress made in the implementation of the Cairo Programme.

The fifth ADALCO meeting recommended that a meeting of experts be held to transform into projects the Programme to Combat Savanization and Sahelization in the Central Africa Sub-region. Due to lack of funding, the expert meeting to draft the projects was never held. In the coming year, the expert meeting should be convened to draft the said projects.

East Africa

Following a mission to Djibouti by DC/PAC and the Regional Office for Africa (ROA) in May 1991, a Memorandum of Understanding covering several areas of cooperation between IGADD, AMCEN and DC/PAC was drafted, discussed and agreed upon with IGADD authorities. But this draft MOU has not been signed. It was felt by DC/PAC that areas proposed would overlap with UNSO's mandate which covers the region.

A new project proposal entitled "Greening IGADD sub-region through enhancing the participatory role of youth in primary and secondary schools" has been drafted, discussed with IGADD authorities, agreed upon and signed. This project proposal aims to:

- Establish school-managed tree nurseries and woodlands;
- Assist national authorities in designing environmental activity work plans (tree growing work plans) with the participation of students and staff;
- Establish in schools, environmental groups that should be involved in local and regional annual compositions on verifiable environmental activities, ecosystems studies and relevant activities, linking these with services and research in national parks, wildlife reserves, ecological heritage sites, etc.

UNEP will provide financial support for holding the first seminar for national resources persons for the preparation of regional and national components of the regional project and the workshop to finalize and approve the regional project document including its national components.

West Africa

A report on the *Control of Desertification and the Spread of t*he Desertification in the South Sahara Zone and the Green Belt, through Programmes of Ecological Rehabilitation prepared by the West African ADALCO consultant/focal point had been elaborated on and submitted to governments in the sub-region and to some institutions, i.e. CILSS. So far, no follow-up action has been taken by Governments nor by institutions to utilize this study and draft project proposals.

During the next biennium 1994 - 1995, this study should be used to draft projects for combatting desertification in the Sudano-Sahelian region.

Particular attention should be given to this region for which a Master Plan to Combat Desertification resources management has been prepared within the framework of the cooperation involving ECA, ECOWAS and UNEP.

In the field of capacity building, a workshop was held in 1989 in Ghana involving village level participants. In 1990 and 1992, two training workshops were held in Nankin, China, under the auspices of the National Environmental Protection Agency (NEPA) to train about 50 technicians and ten village-level leaders from anglophone and francophone countries in techniques of ecological management of villages for sustainable production of food, fodder and fuel in the framework of the AMCEN programme.

A pamphlet on China's Eco-Farming was published in May 1993, by the National Environment Protection Agency of Nankin, China. A consultant will be hired by UNEP-DC/PAC at the end of the year to carry out the work of adapting this pamphlet and its guidelines to AMCEN pilot projects for distribution to all managers of pilot village projects.

Afterwards, an assessment should be carried out by DC/PAC after the training workshop held in China to verify the usefulness of these workshops for participants and particularly to check if acquired knowledge in the field of desertification control had been useful in tackling issues at the grassroots level in some African countries.

A DC/PAC mission to China should be anticipated in early 1994 to discuss with NEPA's authorities on the modalities of drafting this manual.

Some of the problems facing ADALCO

1) Problems facing the AMCEN Programme and its organs, particularly its Committees and networks have been identified in several assessments which have been carried out since the inception of the programme.

All ADALCO meetings, particularly the fifth meeting which was held in Harare in 1991, noted that the lack of funds to implement formulated projects was a major constraint, and strongly recommended that the ADALCO Secretariat and other United Nations agencies, be involved in the procurement of funds for the implementation of anti-desertification projects and activities.

The fifth ADALCO meeting drew up a chart of projects approved by previous meetings of the Committee, which have as yet to find funding. They are:

- One project in the Central African Republic (adopted in 1989 by the third meeting),
- Five projects submitted by Egypt (adopted since 1990 at the fourth meeting),
- Three projects submitted by Sudan (adopted in 1991 at the fifth meeting),
- One project on the Kalahari-Namib desert (approved in 1991 at the fifth meeting).

About 10 project proposals have been drafted by ADALCO Focal Points and are still awaiting implementation due to lack of funding and most of the studies which have been carried out in the framework of ADALCO have not yet been transformed into projects.

The UNDP Financial IPFs should be more particularly utilized to

finance ADALCO activities. Governments do not seem to be aware of this funding possibility and are not exploiting it.

Among the recommendations of the ninth meeting of the UNEP Task Force (5 March 1992) on the re-assessment and streamlining of the AMCEN Programme, the AMCEN Secretariat was asked to prepare a study on success stories of AMCEN activities which have been implemented with the use of IPFs in those countries where such funds have been used for pilot projects.

This recommendation should be achieved in order to stimulate governments to use the UNDP IPFs for the implementation of desertification control programmes.

2) According to the various assessments carried out on the Cairo Programme since its inception eight years ago, governments have made serious efforts to establish environmental management institutions, (about 41 out of the 51 countries have set up Ministries of Environment and Natural African Resources), there is still a lack of political commitment and willingness to fully participate and provide financial support to the Programme; this situation is reflected by the fact that:
   (i) In most cases, there is a failure to integrate AMCEN objectives, activities and the essential components of the Programme into National Development Plans and Programmes, and into sub-regional and regional structures;
   (ii) There is a low level of involvement and participation by key sectoral national Ministries such as: Planning and Cooperation, Finance, Environment and Natural Resources, Agriculture, Industry, Foreign Affairs, etc.
   (iii) Apart from the implementation of some Pilot Village and Pastoral Zone Projects in some countries, most governments have not integrated concepts and approaches for achieving sustainability and self-sufficiency in food and energy as set out in the Cairo Programme in rural development projects and in development programmes.

To effectively increase awareness and participation of personnel in Central Administrations, it would be fruitful to hold training workshops at the sub-regional level (ECOWAS, SADCC and IGADD, Arab Maghreb Union—UMA, etc.) on the integration of environment issues, particularly desertification control issues in the planning process. These training workshops would be organized for top level personnel in Ministries of Planning and the Environment in order to make them fully aware of these important issues.

3) Most of the AMCEN assess-ments clearly indicated that lack of reliable and concrete support from the international community in contradiction to the interest taken in environmental issues, was difficulty to overcome.

It is to be hoped that after the adoption of the International Convention on Desertification Control, the international community will take more interest in desertification control issues and fully support the implementation of this Convention and the AMCEN Programmes as well.

The ThirdTraining Course on Desertification Assessment and Control for Latin America and the Caribbean Region

A training course on desertification assessment and control was held in Mendoza, Argentina from 22 November to 15 December 1993 for Latin America and Caribbean (LAC) countries. It was organized by UNEP in cooperation with the Instituto Argentino de Investigaciones de las Zonas Aridas (IADIZA and FAO).

The overall objective of the training course was to address the issues of desertification/land degradation in arid and semi-arid ecosystems, with a special focus on:

(i) Facilitating the extensive use of the application of proper anti-desertification techniques;
(ii) Promoting development of internationally acceptable methodologies and techniques for desertification assessment and control;
(iii) Strengthening regional and international cooperation in anti-desertification activities;
(iv) Improving the capacity of countries concerned in the LAC region to deal with desertification issues through exchange of information, experience and training.

In all, 25 participants from Argentina, Bolivia, Brazil, Chile, Colombia, Cuba, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Paraguay, Peru, the Dominican Republic and Venezuela attended the course which was both practical and theoretical and incorporated lectures, seminars, discussions, exchange of national experiences, field studies and study tours.

More than 30 prominent scholars and experts from leading research institutions and universities from Argentina, Chile, Brazil and Mexico were invited to share their knowledge and experience.

BOOK REVIEW

Title in English: Land Use and Land Degradation in the Lowlands of Kitui and in the Taita Hills (Kenya)

Runge, F. & J. Spönemann (Editors.)
Paderborner Geographische Studien, Volume 4, 1992, 119 pages.

This publication, written in German, deals with recent land use changes and their consequences in two specific but so far hardly investigated regions, with a focus on types and extent of land degradation.

Each chapter provides a summary in English at the end.

Six maps (scale 1:50 000) showing land use, vegetation cover and geomorphological processes of the area are attached separately.

The first contribution by Runge describes the landscape changes through land use and soil erosion in the lowlands of Kitui.

Forms, causes and consequences of landscape changes are analysed by assessing the ecological situation and explaining the temporal and spatial change of population, economy and land use.

By identifying specific erosion forms for different slope angle classes the potential soil erosion hazard in an area is estimated. For the estimation of the present day erosion hazard the vegetation cover degree is taken into account. The results are shown in an enclosed map.

As a general conclusion the area is not recommended as suitable for immigration from other regions of Kenya.

The second chapter by Rehling deals with recent landscape development in the Zombe-Inyuu region of the Kitui lowlands.

On the basis of fieldwork and interpretation of aerial photos the recent and the former state of the Zombe-Inyuu region are mapped. Areas of variably long-lasting land use and the type and density of the vegetation cover are classified and compared with the least degraded vegetation cover areas.

In spite of the growing population numbers an increase of cultivated land cannot be observed. The Akamba still depend on livestock and charcoal production for income. But the distribution of arable land has changed during the analysis period. This is mainly due to shifting cultivation and to erosion that makes farmers abandon fields.

Clearing and destruction of vegetation takes place especially along rivers, roads and near settlements. The decrease of vegetation cover and the severe destruction of soils in the area are certain signs of a continuing process of land degradation.

Etzler gives an historical survey of the colonization and land use systems on the Taita Hills in the third article.

The Taita Hills are assessed as an area of high agricultural potential which allows for a versatile use comprising both tillage farming and livestock breeding. In several phases of settlement the Bantu peoples cultivated the lower margins of the Taita Hills first moving to the higher areas later.

Deeply eroded slopes and organic sediments in the periphery of the hills prove an increased soil erosion in historical times due to inappropriate land use. By means of C-14 dates on charcoal the beginning of erosion is dated to 800 years **Before Present.**

Population growth and increasing lack of land are accelerating soil erosion. As no soil conservation measures are practised the destruction of arable land is continuing.

In the last chapter Torkler describes the land use changes and the evolution of soil erosion processes in the central parts of Taita Hills.

The extent of erosion is shown in the results of measured runoff and erosion rates caused by local rainfall on test sites.

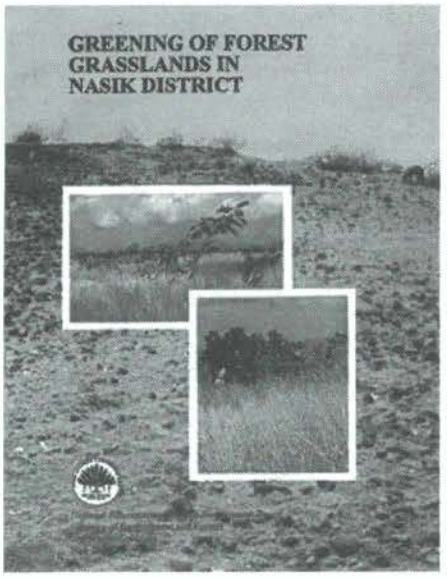
Despite considerable relief (slope steepness), soil erosion is low to moderate due to high infiltration capacity of the acrisols and cambisols. However, where annual crops such as maize are cultivated the rate of soil erosion cannot be tolerated. The predominant erosion process is extensive rill erosion.

In the Taita Hills the potential erosion hazard depends mainly on slope angles which gets reinforced by the present land use changes. By means of multitemporal aerial photograph interpretation the transition from less endangered grazing areas to severe hazardous annual crop areas is demonstrated. One third of the forests and tree stocks existing in 1967 were strongly degraded or cleared in 1986/1987. The cleared sites have been changed to private or state-owned settlement areas or they are used for the cultivation of annual crops especially on steep slopes. These soils, situated in a position where the demand for conservation is highest, are totally unprotected.

The authors state conclusively that the area cannot be recommended as an immigration area. A further extension of agricultural or pastoral land use is not suitable. Tillage farming involves high risk because of the highly variable rainfall patterns in the area. Concerning soil erosion, agriculture on principle should only take place on slopes of less than a 6* inclanation and even then should be combined with soil erosion prevention measures.

Only a well-managed agro-sylvo-pastoral land use system which includes soil erosion prevention will support long-term soil conservation and guarantee sustainable land use in the lowlands of Kitui and on the Taita Hills.

Copies are available at the price of 29 DM from:
Selbstverlag des Faches Geographie
FB 1, Universität-GH Paderborn
Postfach 1621
4790 Paderborn
GERMANY



Greening of Forest Grassland in Nasik District

By R. N. Kaul and M. G. Gogte
A National Afforestation and Eco-Development Board publication, 1993, 33 pp.

This is a very useful and well illustrated publication for those wishing to gain a better understanding of the major problem of forest grasslands degradation, Kuran , in Nasik district, Maharashtra State, India. Grassland degradation is a problem common to other states in India and also to many developing countries. This publication shows how the issue is being resolved by resorting to low cost technology and integrating forestry with fodder production on an area of land, commonly called silvipasture, which seeks to meet the community needs for fuelwood and fodder on a sustained basis.

The publication documents in detail how the seeding of degraded forest grasslands with grasses and legumes will conserve soil and thereby protect the resource base from further degradation while ensuring the availability of much needed fodder of better quality over a period of less than a year.

The results, based on a survey of local farmers reveals that the fundamental reason behind forest grassland improvement is the protective action taken by people themselves. At present most of the production from improved forest grasslands is being disposed of by auction to contractors who sell it to dairy owners and buyers from big towns to the detriment of local people. Community investment in protection is therefore necessary. Options should be geared towards factors that would foster strong community relations in forest grassland protection. This option is vital as the protection of forest grasslands will depend more on a contented fringe population than it will on legal prescriptions.

Copies of the publication can be obtained free of charge from The National Afforestation and Eco-Development Board, Ministry of Environment and Forests, Government of India, Paryavaran Bhawan, C.G.O. Complex, New Delhi - 110 003.

Agricultural Policy and Sustainability: Case Studies from India, Chile, The Philippines and the United States

Edited by Paul Faeth

Ample evidence shows that much of the world's agricultural practices are unsustainable. Yet little effort has been made to measure the health, productivity and economic value of the natural resources on which agricultural activity depends, or to assess the impact on these resources of various farm practices — until now.

This report provides policy makers with much-needed guidelines for evaluating and improving agricultural sustainability. Applying natural resource-accounting principles in six case studies in different parts of the world, the authors determine the inherent profitability of a variety of agricultural production practices, gauge the extent of biases and distortions in current agricultural policy, and suggest policy alternatives that may encourage more sustainable practices.

Contents

About the Editor

Paul Faeth is a Senior Associate in the Economics and Population Programme at the World Resources Institute. He directs WRI's research on the economics of sustainable agriculture.

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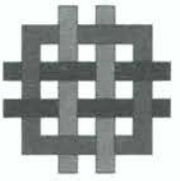
May be requested from Wendy Wahl, World Resources Institute, 202-662-2596.



The 1994 Environmental Almanac

Compiled by the World Resources Institute

Completely updated and revised from the acclaimed 1993 edition, *The 1994 Infor-*

mation Please Environmental Almanac offers general audiences a comprehensive reference on virtually any environmental concern from toxic chemicals in the home to the management of UnitedStates public lands to global population growth. Lively, eye-opening reports and essays, plus hundreds of tables, charts, maps, and graphs make The Almanac equally suitable for fast fact-finding, leisurely browsing, and extended reading. This well-organized paperback is a comprehensive primer, reference book, consumer guide, and practical handbook all-in-one.

Contents

About the Author

Allen Hammond, Editor-in-Chief, is Director, Programme in Resource and Environmental Information, at the World Resources Institute.

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Succes Stories in Desertification Control

A news up-date and call for submissions

Desertification is a global problem that affects first and foremost the economies and well-being of the dryland people as well as the economies of nations that the dryland people subsequently turn to for survival. In addition to the individual losses and suffering of about 900 million people, costs due to desertification include loss of biological diversity, loss of the earth's biomass and bioproductivity and effects on global climatic change. Desertification prevents the achievement of sustainable development; it can lead to economic instability and political unrest in affected areas and also puts pressures on the economy and stability of societies outside affected areas.

In the last issue of the Desertification Bulletin (No. 23, 1993), a call was made to submit information on projects/undertakings that have substantially contributed to the successful control of desertification in arid, semi-arid and dry sub-humid regions.

The aim of the success-story-collection and presentation of "Effective Action Against Desertification Award" is to encourage the emergence of successful undertakings in desertification control and to share this information with others so as to create a public awareness and a renewed mood of confidence that desertification can be successfully controlled. In this regard, an operational database has been created at DC/PAC for storage and retrieval of information received and it is being continuously updated as more information comes in.

The deadline for submission of projects to be considered for the 1994 awards was 30 June 1993. By this date 72 projects/activities had been submitted from Africa, Asia, the Far East, Eastern Europe and Northern America. (No success cases have been received, to date, from the Caribbean and Latin America). These submissions are currently being evaluated internally at DC/PAC. The final selection will be made following an on-site evaluation of the short-listed projects by a team of experts, taking into consideration technical socio-economic aspects as well as their replicability in similar environments.

Success stories, as well as requests for further details criteria guidelines for nominating a success story project, should be submitted to:

Mr W. Franklin C. Cardy
Deputy Assistant Executive Director,
and Director, DC/PAC

Or

Ms. E. Migongo-Bake
Programme Officer
(Success Stories)

United Nations Environment Programme
DC/PAC
P O Box 30552,
Nairobi, Nairobi
Fax: 254 2 215615

CONFERENCES

Training Workshop on Dryland Agriculture

Dryland Agriculture Institute
West Texas A & M University
6 June - 1 July, 1994

The workshop is designed to present information on dryland agriculture and provide the opportunity to visit dryland research facilities and farms in the southern and central United States Great Plains.

The region is one of the largest dryland agricultural regions of the world, and its development has had both positive and negative impacts on crop production and the environment. Experiences of the region are a valuable resource base for scientists, technology transfer personnel, planners and policy makers for other dryland regions of the world. Soil degradation was very pronounced during early development of the area and led to very severe wind erosion. Technologies have been developed that have, for the most part, arrested soil degradation and increased yields.

The Great Plains is also a major irrigated region but water resources are being depleted, particularly in the southern Great Plains. Although the workshop will not emphasize irrigation, attention will be given to technologies and practices designed to use limited water supplies in dryland regions. The conjunctive use of limited water supplies and rainfall is extremely important in semi-arid regions and a wealth of information and experience has been obtained in the area.

The Workshop will be on the campus of West Texas A&M University in Canyon, Texas, 25 km south of Amarillo.

Presentations - Week One

The first week will consist of presentations about soil and water resources of the Great Plains and the history of agricultural development in the region. Both positive and negative impacts of its development will be emphasized.

Tours - Week Two and Three

The second and third weeks of the workshop will consist of two tours; the first of the southern Great Plains and the second of the central Great Plains.

Presentations - Week Four

The final week of the workshop will be on the West Texas A&M University at Canyon, Texas, to discuss in detail some of the experiments and farms seen on the tours. Specific technologies will be presented and evaluated in terms of impact on soil and water conservation, crop production, soil quality, water quality and the environment.

Time will also be scheduled during the workshop for participants to make presentations about their countries, with particular reference to soil and water resources and cropping systems. Facilities for showing 35 mm slides and overhead transparencies will be available. This part of the workshop will be very beneficial in giving the participants a broad overview of dryland agriculture worldwide.

Seventh Annual Hunger Research Briefing and Exchange

The Alan Shawn Feinstein World Hunger Programme, Brown University (A Centre for Research and Education) and InterAction, The American Council for Voluntary International Action
Brown University, 13 - 15 April 1994

The Alan Shawn Feinstein World Hunger Programme has, for the past six years organized a major conference, The Hunger Research Briefing and Exchange in collaboration with InterAction, the American Council for Voluntary International Action. Below is an announcement for the seventh annual briefing which will be held from 13 to 15 April 1994 at Brown University in Providence, Rhode Island:

Hunger and Development: Balancing Actions

Linking Local Solutions to Global Policies

Some of the topics to be addressed:

How do Programmes Balance Overcoming Hunger With Sustainable Development?
What Impact do Changing International Health Initiatives have on Hunger?
Food Security and Economic Development: Safety Nets and Other Strategies?
Hunger and Economic Development: Safety Nets and Other Strategies?
Sanctions: Need There be Tradeoffs Between Hunger and Democracy?
Linking Hunger and Populations: Shared Goals, Shared Resources.
Linkages: Public and Private Partnerships for Combating Hunger.

And the awards ceremony for the 1993-1994 Alan Shawn Feistein World Hunger Awards.

As in the past, thebriefing will offer an extensive exhibit of books and other publications. More than 150 individuals from government and academic institutions and private voluntary organizations around the world typically attend the briefing.

Please note:

The Briefing will be three days this year - Wednesday, Thursday and Friday. **The Awards dinner and ceremony** will be held on Thursday evening.

For information please contact:

Nina P. Schlossman
Faculty Adviser for the Briefing
Brown University
Box 1831, Providence
Rhode Island 02912
USA.

Telephone: (401) 863-2700
Fax: (401) 863 2192
E-mail Messer@brownvm.brown.edu

International Course on Dryland Farming

Yangling, China
29 August - 17 September, 1994

Introduction

Every year International Technical Training Courses on various subjects are conducted in China under the auspices of the State Science and Technology Commission of China (SSTCC) as part of its International Scientific and Technical Cooperation Programme.

The Course on Dryland Farming in 1994 will be arranged by the Department of International Science and Technology Cooperation SSTCC in collaboration with Wugong Agricultural Science Research Centre (WASRC).

Course Description

Objectives
The objectives of this course are to provide up-to-date knowledge, information and practical experiences on theoretical as well as practical aspects of dryland farming to people, mainly from developing countries, who are engaged in production management,. research and teaching in dryland farming. In order that they use these newly gained skills to make a greater contribution to the development of food production and improvement of dryland farming under their own geographic socio-economic situations.
Through lectures and exchange visits the participants will be able :
1)To upgrade their knowledge of new developments in production and research of dryland farming;
2)To understand in-depth the history, present situation and achievements of dryland farming in China;
3)To master the key points of theory and available skills on dryland farming both in China and other parts of the world;
4)To promote understanding and friendship between participants, and to provide the opportunity for international cooperation and exchange in dryland farming and other related fields.
Duration
20 days from 29 August to 17 September, 1994.
Working Language
English

Host and Location

Wugong Agricultural Science Research Centre
Yangling, 712100
Shaanxi Province
P.R. China
Telephone: (0910) - 712371
Fax: (0910) - 712377; (0910) - 712570
For more information please Contact: Hui Jiazheng, Wang Jucang.

NEWS OF INTEREST

Establishment of Mountain and Desert Research Cell

In order to provide impetus to the efforts for the research and development of mountain and desert agriculture in Pakistan, a Mountain and Desert Research Cell is being created at the Rangeland Research Institute, NARC, Pakistan Agricultural Research Council, Islamabad. The cell will perform the following functions:

- Coordinate activities and programmes related to mountain and desert research in Pakistan;
- Act as focal point and centre for collaboration with international organizations i.e. (ICIMOD, ESCAP, UNEP, IUCN etc.) and NGOs for assistance and formulation of joint programmes having a bearing on mountain and desert agriculture;
- Serve as a data bank about various aspects of mountain and desert research and development;
- Develop and carry out projects/ studies with the support of national and international organizations in these areas.

Dr Noor Mohammad, Director, Rangeland Institute, NARC will act as National Coordinator of the Cell. Dr. Maqsood Anwar, SO, (Wildlife) will assist the National Coordinator until a full-time scientist is appointed.

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 adopted by the UN Conference on Environment and Development (UNCED), Rio de Janeiro, Brazil, in June 1992.*

Desertification Control Bulletin
United Nations Environment Programme