

WHY CAN'T DEVELOPED COUNTRIES CONTROL DESERTIFICATION?

SJ Milton¹, WRJ Dean¹, MT Hoffman² & GIH Kerley³

¹FitzPatrick Institute, University of Cape Town, Rondebosch 7700

²Stress Ecology Research Unit, National Botanical Institute, P/Bag X7, Claremont 7735

³Terrestrial Ecology Research Unit, Department of Zoology, University of Port Elizabeth, P.O.Box 1600, Port Elizabeth 6000

The authors were the South African delegates to the International Symposium and Workshop on Desertification in Developed Countries held in Tucson, Arizona from 24-29 October 1994. In addition to the 37 oral presentations and 32 posters presented by delegates from 14 countries, there were workshops and field excursions. Here we report on some papers, discussions and observations that are relevant to current landuse issues in southern Africa.

Desertification, or the loss of agricultural and rangeland productivity through changes in ecosystem function as a result of vegetation change, desiccation, salinization and erosion, is a concern of developed as well as developing countries, for although poverty may lead to land mismanagement, wealth does not ensure land conservation (Dregne, Jallow). Arid and semi-arid lands are more susceptible to desertification than mesic regions. However, as 20% of the world's population lives in arid and semi-arid areas (Schlesinger) the land cannot be taken out of production. What types of landuse are appropriate for such sensitive areas?

Appropriate and inappropriate landuse

Many delegates presented case histories dealing with examples of inappropriate uses of arid areas. These included ploughing of marginal land in Spain (Barth), irrigation procedures that polluted the ground water, prevented its recharge in Israel (Banin) or used surface water faster than it could be renewed as in the land surrounding the Aral sea in central Russia (Saiko). In the Americas, Australia and South Africa, an unrealistically high density of livestock rather than crop farming appears to be the primary cause of desertification (Garduño, Hess & Holecheck, Ludwig & Tongway, Dean et al.). Rainfall is variable in arid areas and the effects of inappropriate landuse are exacerbated when annual rainfall is below average (Hoffman et al.).

Few delegates ventured to suggest forms of landuse that might be appropriate for arid regions. When environmental damage is motivated by necessity, as often happens in over-populated rural areas, alternatives that are sustainable in the long term (century) but cause short-term (decade) declines in living standard are generally unacceptable. In the workshops as well as the plenary session it was clear that the need to address simultaneously the issues of social betterment and sustainable landuse caused an impasse that few delegates (whether administrators, managers or academics) seemed able to tackle. Among the concrete proposals for reorganizing landuse to protect resources and benefit user communities were those of Kerley (South Africa) and Lowe (USA).

Kerley suggested that an expansion in wildlife (elephant, black rhino, kudu) ranching for meat and ecotourism in Eastern Cape Thicket could generate additional income in this area to the benefit of poor rural communities, and may be a more sustainable use of the land than goat ranching which has already desertified large parts of the eastern Cape. In the densely populated Navajo Reservation in the Four Corners area of the USA, Lowe showed how community consultation and incentives for conservation management had led to full participation in planned rotational grazing and to an improvement in living standard.

Restoring lost function to desertified ecosystems

Workshop discussions identified changes in soil processes, energy fluxes and life-form diversity as indicative of desertification. Many contributors to the plenary session considered that recovery of desertified ecosystems depended on restoration of soil processes (Whitford). Excessive grazing reduces vegetation cover whereas trampling compacts the soil and removes bacterial and fungal crusts which fix nitrogen and trap moisture (Belnap). The resultant accelerated runoff and poor infiltration exacerbates grazing and trampling effects (Lomeli). Nutrients tend to be lost from desertified ecosystems, or to be redistributed to islands of deep-rooted shrubs that benefit from decreased herbaceous cover (Schlesinger). Ambient temperatures are 4°C higher over overgrazed Mexican rangelands than on the USA side of the border (Hutchinson). Similarly, in the Middle

East, temperature increases of 0.07°C per decade (1950-1990) have been attributed to soil exposure (Nasrallah & Balling).

Restoration of function (water holding capacity, nutrient cycling) to desertified soil can be facilitated by shading the soil (Imerson). Reducing rates of runoff through construction of barrages further facilitates infiltration and vegetation establishment (Ludwig & Tongway), but unless carried out on a small scale by land users, is extremely costly: it took US \$1.3 million to restore grass and trees to the eroded San Simon valley in Arizona (Bureau of Land Management). Some attempts at restoration have only worsened the problem. For example, planting of pines on steep slopes in a seasonally arid region increased runoff and sediment loss (Williams et al.). If restoration is to be cost effective, it should be properly planned and monitored. In Chile, where desertification affects the lives of 1.5 million people and where mitigation is expected to cost over one billion US \$, carefully planned state policy to ameliorate desertification focuses on the poorest and worst affected communities. Land use problems are addressed simultaneously through education and action-orientated projects (Arroyo).

People and policy

The South African government is committed to making agricultural land and other natural resources including water, grazing and game accessible to the rural poor. It is argued that unless such people benefit directly from the natural environment and take responsibility for its Management, they have no incentive to conserve it (Hanekom & Liebenberg 1994). Much of America's rangeland is state-owned and is rented to ranchers who, since they cannot own it, have little incentive to manage it sustainably. Land tenure systems undoubtedly influence attitudes to resources. But other factors, including population density (Arroyo, Lowe, Nasrallah & Balling) and legislation relating to taxation and subsidization may exert equally powerful influences on land management.

In the developed countries it appears to have been poor policy rather than poor people that has motivated abusive landuse practices. Policies that reward poor rangeland Management in the USA include legislation that re-allocates common land that carries no cattle, heavy taxation on ecotourism and other non-consumptive land uses, financial support for reclamation programmes that are not cost-effective, and subsidization of emergency feeds (Hess & Holecheck). Similarly, drought subsidies in South Africa have caused desertification by sustaining ranching in regions where rainfall is too variable to support settled agriculture (Milton & Dean).

Workshop sessions concluded that desertification was driven by human population growth and/or by increased per capita use of resources. The deployment of farmers on the land should not overstep the regional potential for providing forage and water in the driest years (Dean et al.). Past land distribution policies in Russia and South Africa concentrated people and animals on inadequate parcels of land and interrupted traditional stock rotation systems (Zonn, Boonzaier et al. 1990), resulting in rangeland damage which will take huge sums of money and many lifetimes to reverse. New decision makers should endeavour to avoid past mistakes. South Africa, in common with other semi-arid parts of the world, needs policies that discourage rapid population growth, facilitate environmental education and foster local involvement in planning the sustainable use of natural resources in rural areas. Good policy, secure tenure and international sharing of expertise have potential for breaking the spiral of poverty, violence and land degradation that plagues overcrowded, powerless rural communities (Fox, Jallow).

Developing countries

The provisional theme for a follow-up meeting planned for 1997 is *Science and community action to prevent desertification*. The proposed venue is once again Arizona, USA because the symposium will be organized and funded chiefly by the United States Bureau of Land Management and the US Environmental Protection Agency. The organizers hope to encourage interim preparatory workshops in developing countries because these should be the major contributors to the 1997 symposium. Those interested in interim planning should approach Beaumont C. McClure, USDI Bureau of Land Management, 3703 N 7th St, Phoenix AZ 85014 USA, Fax 01 602 650 0398.

Acknowledgements

The Bureau of Land Management (BLM), United States Department of Agriculture funded the participation of WRJ Dean, GIH Kerley and SJ Milton at the International Symposium and Workshop on Desertification in

Developed Countries. Participation by MT Hoffman was sponsored by the National Botanical Institute and the Department of Environment Affairs. We thank Beau McClure (BLM, Phoenix Arizona) and Walt Whitford (USDA, Las Cruces, New Mexico) for facilitating our attendance at the symposium.

Symposium papers

- Arroyo M. Extent of the desertification process and proposals for action-orientated measures to ameliorate its effect in seven regions.
- Banin A. Secondary desertification due to salinization and sodification of intensely irrigated lands - the Israeli experience.
- Barth HK. Environmental implications of socioeconomic change in southeastern Spain.
- Belnap J. Soil surface disturbances: their role in accelerating desertification.
- Dean WRJ, Milton SJ & du Plessis MA. Where, why and to what extent have rangelands in the Karoo, South Africa, desertified?
- Dregne HE. Desertification control: a framework for action
- Fox TH. Desertification: who needs to do what?
- Garduño MA. Desertification in Mexico: problems and possible solutions.
- Hess K & Holecheck JL. Policy roots of land degradation in the arid region of the United States: an overview.
- Hoffman MT, Bond WJ & Stock WD. Desertification of the semiarid Karoo, South Africa: evidence from soil isotopes and matched photographs.
- Hutchinson CF. Assessing desertification through multi-spectral and multitemporal sensing techniques.
- Imerson AC. An integrated methodology for linking desertification to socioeconomic and policy factors at the ERMES field locations in Spain, Crete and Israel.
- Jallow T. Challenges and opportunities in the implementation of the International Convention to Combat Desertification.
- Kerley, GIH, Knight MH & de Kock M. Desertification of subtropical thicket in the Eastern Cape, South Africa: are there alternatives?
- Lomeli B. Desertification responses of an international southwestern river.
- Low NS. Communal grazing regulation and conservation grazing management adaptations on Navajo new lands.
- Ludwig JA & Tongway DJ. Desertification in Australia: an eye to grassroots and landscapes.
- Milton SJ & Dean WRJ. Southern African rangelands: why are they changing and can they be restored?
- Nasrallah HA & Balling RC. Impact of desertification on temperature trends in the Middle East.
- Saiko TA. Implications of the disintegration of the former Soviet Union for desertification control.
- Schlesinger WH. Global consequences of desertification.
- Whitford WG, Martínez-Turanzas G & Martínez-Meza E. Persistence of desertified ecosystems: explanations and implications.
- Williams AG, Ternan JL & Elmes A. A field study of the influence of land management and soil properties on runoff and soil loss in central Spain.
- Zonn I. Desertification in Russia: problems and solutions.

Other references

- Boonzaier EA, Hoffman MT, Archer FM & Smith AB 1990. Communal landuse and the "tragedy of the commons": some problems and development perspectives with specific reference to semi-arid regions of southern Africa. *J. Grassld. Soc. Sth. Afr.* 7:77-80.
- Hanekom D & Liebenberg L 1994. Utilization of National Parks with special reference to the costs and benefits to communities. *Bull. Grassld. Soc. Sth. Afr.* 5(2):25-36.

Bibliography of southern African arid zone literature up to 1993

Contains over 6 000 published and unpublished references on the Namib, Kalahari and Karoo deserts and adjoining semi-desert regions.

Covers a wide array of disciplines including plant and animal ecology, agriculture, animal husbandry, dry land crop production, archaeology, palaeoecology, geology, geography and history.
(References are keyworded to assist literature searches).

Available as word processed document (Word Perfect 5.1 or MSWord 5.1) on two 1.44 MB diskettes.

R 40-00
for southern African
individuals.

Cost

US \$30 (or equivalent)
for international
workers or Institutions

Please indicate preferred software and send cheque or money order made out to National Botanical Institute to:

Dr M Timm Hoffman
National Botanical Institute, Stress Ecology Research Unit
Private Bag X7, Claremont, 7735, South Africa
Tel: +27-21-762-1166 Fax: +27-21-797-6903
e-mail: hoffman@nbict.nbi.ac.za