

Desertification Control Bulletin

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

Number 11, December 1984



- The United Nations Conference on Desertification (UNCOD) was held in Nairobi from 29 August to 9 September 1977.
- This was the first worldwide effort ever initiated to consider the global problem and responsibilities posed by the spreading deserts.
- 95 States, 50 United Nations offices and bodies, 8 intergovernmental organizations and 65 non-governmental organizations participated.
- The United Nations Conference on Desertification prepared and adopted a worldwide Plan of Action to Combat Desertification (PACD) with 28 specific recommendations.
- The Plan of Action was approved by the United Nations General Assembly at its 27th session on 19 December 1977.
- Recommendation 23 of the Plan of Action 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 co-ordinating the implementation of the Plan of Action to the United Nations Environment Programme

(UNEP) with its Governing Council (GC) and Administrative Committee on Co-ordination (ACC).

- Immediately after approval of the Plan of Action, the Desertification Branch was established within the UNEP Office of the Environment Programme to serve the Executive Director and ACC in carrying out their tasks in the implementation of the Plan of Action.
- One of the main functions required by the Plan of Action from the Desertification Branch was to prepare, compile, edit and publish at six-monthly intervals a newsletter giving information on programmes, results and problems related to the combat against desertification around the world.

Editors

Gaafar Karrar
Acting Head
Desertification Branch

Daniel Stiles
Desertification Branch

Stanislaw Sangweni
Desertification Branch

Seifulaziz L. Milas
Information Service

Tibursi Lyimo
Information Service

Desertification Control Bulletin



United Nations Environment Programme

No. 11 December 1984

Contents

		Page
Desertification: a question of linkage	<i>Daniel Stiles</i>	1
Desert spread and population boom	<i>Seifulaziz Milas</i>	7
Ecological villains or economic victims: the case of the Rendille of Northern Kenya	<i>Michael O'Leary</i>	17
Controlling sand dune encroachment in Iraq	<i>Ferenc Gati</i>	22
News from UNEP		27
News from Agencies		31
News of interest		38
Book Reviews:		45
• <i>Desertification of Arid Lands</i>		
• <i>Earth Matters: Environmental Challenges for the 1980s</i>		
• <i>Natural Resources and Development in Arid Regions</i>		
• <i>Farm and Community Forestry</i>		
• <i>Aridic Soils of Israel: Properties, Genesis and Management</i>		
• <i>Sahara ou Sahel? Quatenaire récent du Bassin de Taoudenni (Mali)</i>		
Questionnaire		50

COVER PHOTOGRAPH:

Firewood is becoming a scarce resource in many parts of Rendille land in Northern Kenya, particularly around permanent settlements. (UNEP/Daniel Stiles)

Desertification Control Bulletin is an international bulletin published at six-monthly intervals by the United Nations Environment Programme (UNEP) to disseminate information and knowledge on desertification problems and to present news on the programmes, activities and achievements in the implementation of the Plan of Action to Combat Desertification 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.

- Material not copyrighted may be reprinted with credit to

Desertification Control Bulletin,
UNEP.

Desertification Control Bulletin is published in English. Inquiries should be addressed to:

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

Desertification: a question of linkage

Daniel Stiles
Desertification Branch

Great numbers of people and millions of livestock animals died due to drought-related causes in the Sudano-Sahelian region in the early 1970s, and many more people were impoverished. What experts had known for a long time suddenly came to the attention of Governments and the man-in-the-street: land in many parts of the world was degrading into desert, and deserts do not produce food. The serious droughts of the late 1960s and early 1970s in Africa aroused the international community and triggered the United Nations Conference on Desertification (UNCOD), where 94 countries and many international bodies deliberated on the problem in Nairobi in 1977. At that time it was thought that the Sahelian drought of 1968-1973 was over. Today we know that the near-normal rains which fell in 1974 and 1975 were only a temporary respite. Like a spectre come back to haunt us, the same kinds of stories that we read then are re-appearing in the world's news media—but now it is the great drought of 1968-1984, and it may not be over yet.

In fact, it looks like the drought conditions are spreading. The period 1982-1983 was one of the worst in recorded history for worldwide drought, threatening more people than ever before. Many parts of Africa, North America, Australia, South America, Europe and Asia all suffered somewhere from severe dry spells. Experts are increasingly investigating the possibility of a relationship between changes in the environment, which are man-induced, and climatic change.

Drought is a temporary problem, desertification is not. Man can do little or nothing to prevent drought, he can halt desertification, which in the long run is a much more serious problem. Realizing this, UNCOD formulated a

comprehensive Plan of Action to Combat Desertification (PACD) which contained a number of recommendations on action to take at the national, regional and international levels to halt and even reverse the desertification process. The Conference gave UNEP the job of following up and co-ordinating the implementation of the Plan of Action.

The PACD called for a first General Assessment of Progress in its implementation after the seven year period 1978-1984. UNEP was involved in this activity for over two years and a summary of the findings was presented in a report by the Executive Director, Dr. Mostafa Tolba, to the twelfth session of the UNEP Governing Council in May of this year.¹ Two special days were devoted to a consideration of the assessment results by the 58 Member States, 35 observer States, and UN and other international bodies attending. In his report, Dr. Tolba presented a fresh set of recommendations for action over the next 15 years. After a consideration of the report, the Governing Council then adopted recommendations which will guide the actions of UNEP and other concerned organizations, agencies and Governments in future efforts to combat desertification.

The main findings of UNEP's global assessment were:

1. The scale and urgency of the problem of desertification as presented to UNCOD have been confirmed. The goal set by UNCOD to arrest the advance of desertification by the year 2000 is no longer feasible.
2. Desertification threatens 35 per cent of the earth's land surface (45 million sq. km) and 19 per cent of its population, some 850 million people. 75 per cent of this area and 60 per cent of the population are already affected (see figures 1 and 2).
3. Of the world's drylands (defined by

UNEP as including arid, semi-arid and sub-humid areas), 60 per cent are already affected by desertification, with between a quarter and a half severely so.

4. In the seven years since UNCOD, desertification has extended and intensified in all its forms as follows:

(a) Land lost—i.e. reduced to desert-like conditions—continues at 60,000 sq. km annually, the rate reported in 1977;

(b) Land reduced to zero or negative net economic productivity is showing an increase at 210,000 sq. km a year;

(c) Areas affected:

- rangelands 31 million sq. km (80 per cent of the total)
- rainfed croplands 3.35 million sq. km (60 per cent)
- irrigated lands 400,000 sq. km (30 per cent of the total)

5. The total desertified area of 34,750,000 sq. km makes up 75 per cent of the productive area in the world's drylands and 40 per cent of the entire world's productive area.
6. The direct cost of desertification in the form of a loss in agricultural production stands at \$26 billion annually, not counting the serious social costs.

These staggering findings serve to reinforce the view at UNEP that desertification is one of the major problems facing mankind today. If the march of desertification continues, by the year 2000 the situation will have become a global catastrophe, according to the conclusions of the assessment.

In a recent interview with a Nairobi-based journalist, Dr. Tolba said that "patching exercises" were not enough

1. UNEP "General Assessment of Progress in the Implementation of the Plan of Action to Combat Desertification 1978-1984," UNEP/GC.12/9, 1984.

Desertification: a question of linkage

Figure 1. Global extent of lands at least moderately desertified, by land-use categories (Millions of ha.)

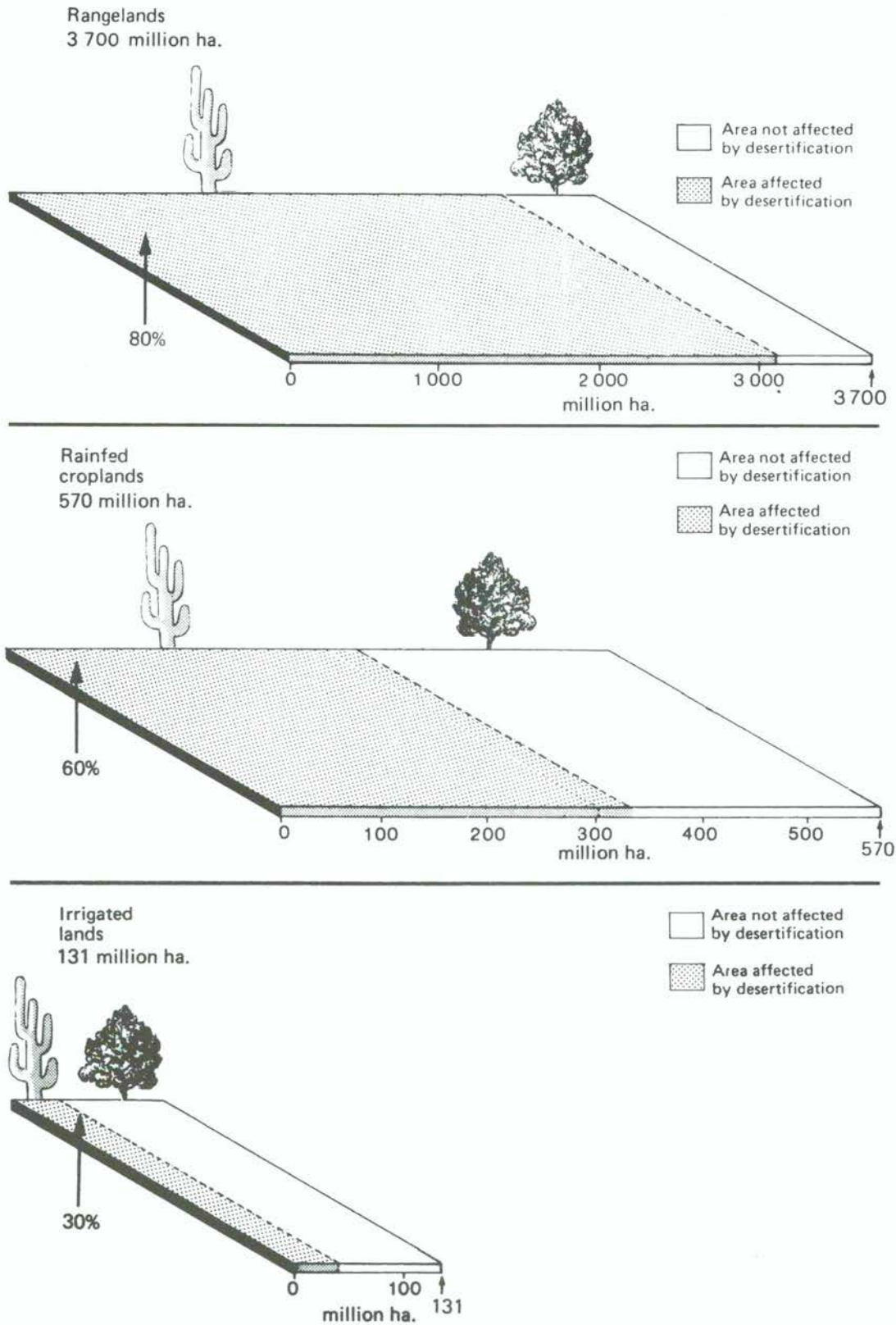
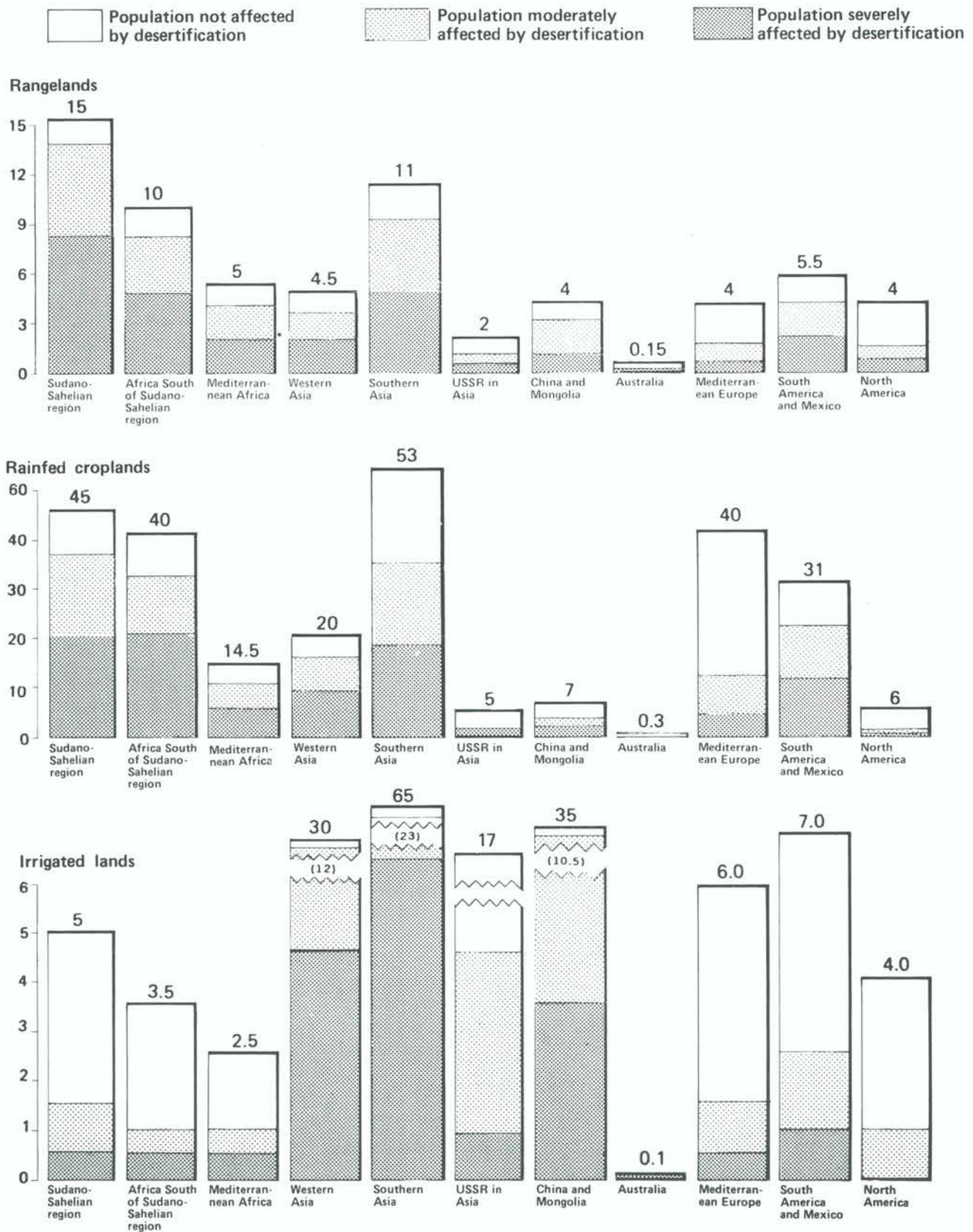


Figure 2. Rural population affected by moderate or severe desertification respectively in the major regions and subregions of the drylands under main types of land use (Millions)



Desertification: a question of linkage

to thwart the crisis. "Either you control desertification by a full, integrated programme to stop it, or you try to stop it by bits and pieces and nothing will stop. We said in 1977 that the recommendations (of the PACD) were not to be taken in isolation. You might implement them at varying rates, but they have to be implemented together . . .

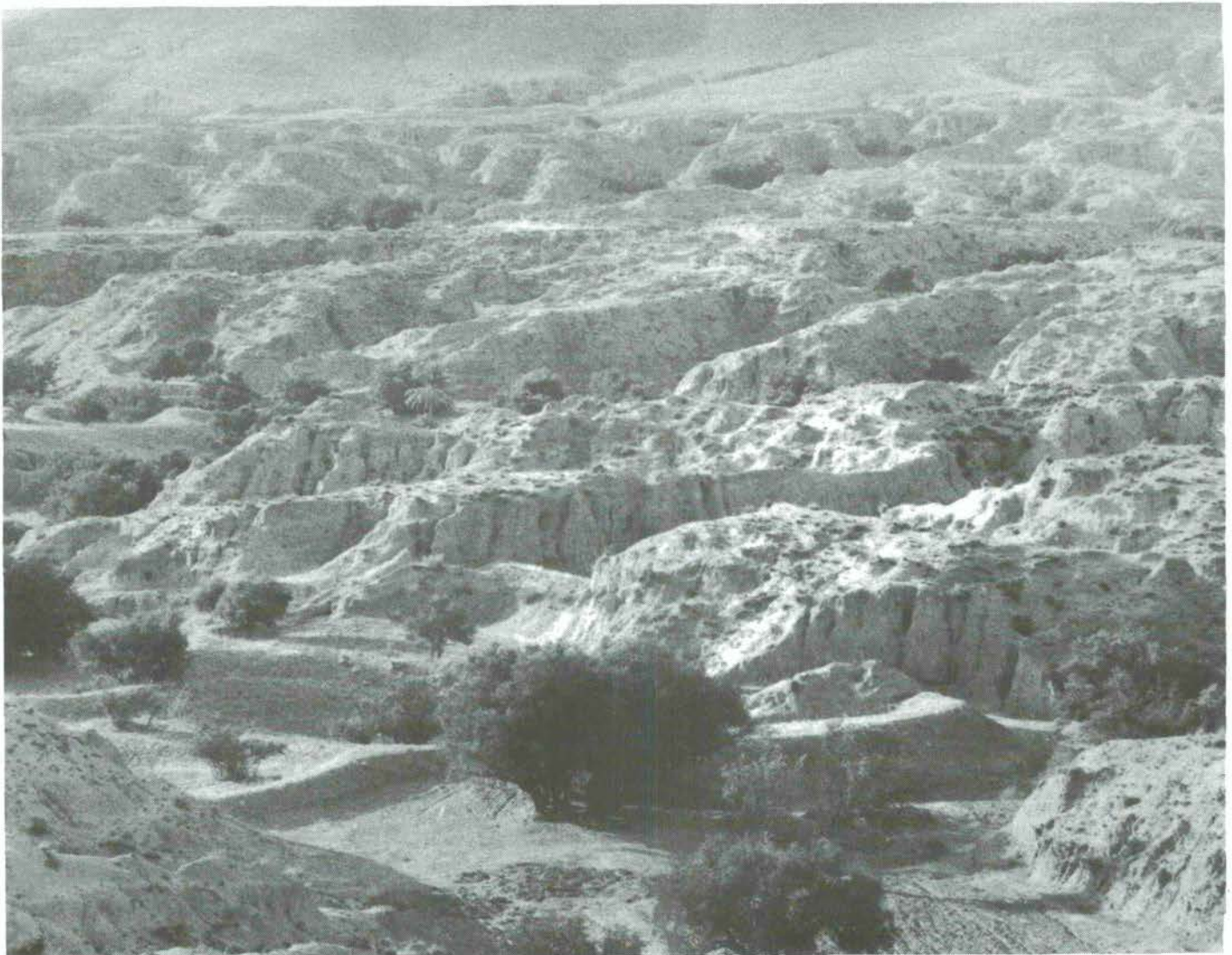
We said this loud and clear and the desertification conference approved it, the General Assembly approved it, and here we are just where we were in 1977."

Why has so little been done since 1977 to implement the 28 recommendations contained in the PACD? An expert study group estimated that it

would cost about \$4.5 billion per year over a 20-year period, or \$90 billion in all, to put into effect the main components of the PACD. This sounds like a lot of money, but when compared to the cost of lost agricultural production over the same period—\$520 billion—it seems like a very sensible investment. A Special Account for financing anti-desertification projects was established six years ago. Less than \$50,000 has been contributed, none of it from developed countries. That is part of the problem in implementing the PACD.

Developed nations prefer to give assistance through bilateral aid agreements. In this way they reap secondary benefits from their own largesse— contracts, employment,

political influence, etc. Several hundred million dollars have been spent since UNCOD on desertification-related projects in affected countries, but because the efforts were not well co-ordinated the results have had minimal impact in stopping desertification. Donor countries and international financing organizations need to put more trust into UNEP's ability to utilize funds effectively, and they must learn to put less emphasis on their own immediate self interest. In the long run, it is in everyone's self interest to halt desertification. Loss in agricultural production due to desertification leads to hunger and poverty in the affected countries. A large poor population leads to political instability and economic stagnation, neither of which are good for international trade or the professed goals of development.



This land in southern Tunisia has been eroded — desertified — as a result of overgrazing and wood-cutting. (WFP-FAO/F. Botts)

Another problem involves policies within the affected countries. Desertification is not usually accorded a priority position in development planning. In most countries there is no effective internal governmental 'lobby' to negotiate for anti-desertification funds. National leaders like to have quick visual evidence of their actions, and environmental programmes do not yield immediate returns. When government ministries request foreign aid, therefore, they are most often for structures such as roads, bridges, factories and dams. The donor countries are very happy to fund such projects as they, too, like to see the concrete results from their assistance.

To mount an effective campaign to stop desertification national priorities in affected countries have to be realigned. Government leaders must understand that desertification is not drought, which ceases when the rains return, but that it is a steady process that is robbing their lands of productive capabilities, rendering their economies even more dependent on outside sources of support. One of the first steps to take to ameliorate the situation, as recommended in the PACD and re-emphasized in the Executive Director's report, is to establish a national machinery and institutional support to co-ordinate national action. This involves developing a national Plan of Action to Combat Desertification, in which a detailed assessment is made of a country's desertification problems, priority projects are identified to address the most serious of them, and the institutional support to organize and co-ordinate the National Plan is at least outlined. A lack of national Plans of Action or of specific institutions to deal with desertification has been a great hindrance to the implementation of the PACD at both the national and global levels.

UNEP is prepared to give assistance to any developing country in the preparation of National Plans of Action and in the formulation of priority anti-desertification projects. UNEP first needs an invitation from the Government, however, and these have been very few in coming. Since the Desertification Branch was established in 1978 in UNEP only three countries have been assisted in this way—Tanzania, Burundi and Uruguay

and exploratory missions have been sent to Bangladesh, Nepal, Yemen Arab Republic, Yemen People's Republic, Benin, Botswana and Lesotho, and others are currently being planned. The UN Sudano-Sahelian Office (UNSO) undertakes the co-ordination and follow-up of the PACD in the twenty-one Sudano-Sahelian countries on behalf of UNEP and National Plans are in preparation in several countries in the region.

Following the presentation of the Executive Director's report on the General Assessment to the Governing Council, UNEP is planning a new campaign to give new direction and life to implementation of the PACD, stressing a policy directed towards showing the relevance of the environment to the broader process of economic and social development. Combating desertification is a prominent feature in UNEP's 1984 State of the Environment Report which singles out a number of environmental problems in need of co-operative efforts between developed and developing nations.

The main difference between UNEP's understanding now and seven years ago of the nature of the problem of desertification is a more thorough appreciation of the universality of its impacts and causes which extend well beyond the drylands most immediately affected. Desertification results not only in the loss of a nation's productive resource base but also in the loss of valuable genetic resources, increase in atmospheric dust and land albedo (which could have as yet unknown consequences on the global climate), disruption of natural water cycling processes and, ultimately, of viable space in which to live. Desertification threat to the planet's life support systems is causing social and political breakdowns which in turn threaten global security. UNEP believes that a failure to recognize this environmentally-induced threat lies at the root of the apparent unwillingness of nations' leaders to tackle desertification in a serious manner.

The problems of the cities are also closely interrelated with those of the



Water brought from the Himalayas in the Rajasthan canal is being used to irrigate desert areas in India. Proper land use can result in food production in desertified areas. (FAO/D. Mason)

rural areas. Overpopulation and loss of land productivity have forced many villagers into the towns to seek employment. Without supplements of imported grains and other agricultural products many developing countries would experience serious food shortages in the urban areas. Today the news media and the world's leaders speak of food imports from the developed nations as temporary measures made necessary by the effects of

drought. If desertification is not halted, however, the system of food imports to countries affected by desertification may become a permanent feature of world trade. If desertification is not stopped the idea of food self-sufficiency for dozens of countries will be no more than a mirage for the foreseeable future. The food producing nations will be responsible for the sustenance of tens and even hundreds of millions of the world's destitute

people in the drylands indefinitely.

"It is the failure to perceive these linkages and interconnections which lies at the bottom of the failure to arrest desertification", comments Dr. Tolba. "When the minority in government and among the general public who now perceive these linkages become a majority, the crucial battle in the war against desertification will be won."

Desert spread and population boom

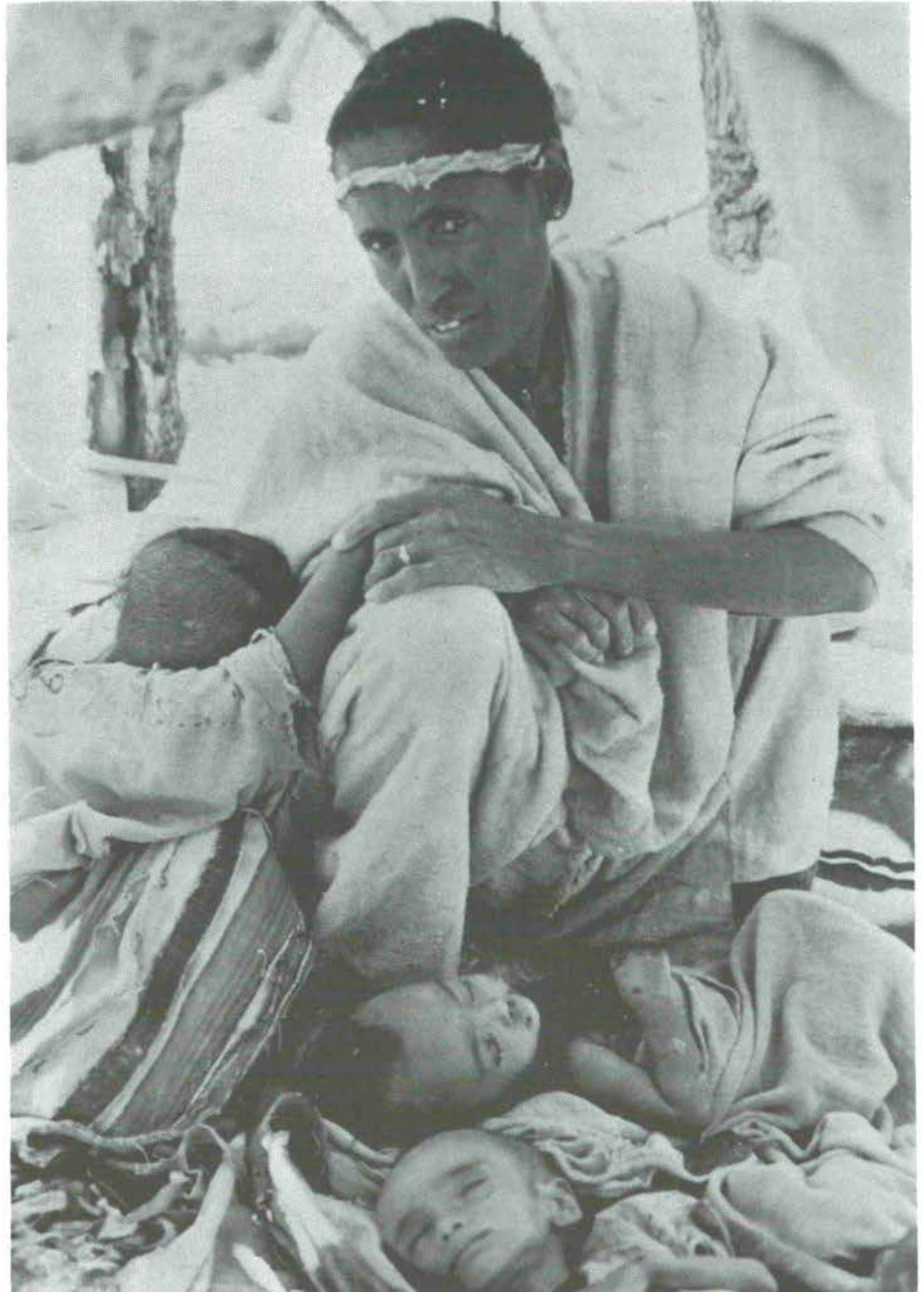
*Seifulaziz Milas
Information Service, UNEP*

The International Conference on Population in Mexico City (6–14 August, 1984) focused world attention on a worsening situation of expanding population size, diminishing resources, intensifying underdevelopment, and continuing environmental deterioration, particularly in the developing countries.

Since the World Conference on Population was held in Bucharest in 1974, the world's overall rate of population increase has dropped from about 2.02 percent a year to 1.67 percent a year, but the number of people on earth has increased by about 800 million to the present level of some 4740 million (Salas, 1984). Over the next 40 years population is expected to nearly double to reach about 8200 million. Of these, about 7000 million people will live in poor developing countries (UN Department of International Economic and Social Affairs, 1981). Many of these countries are already overpopulated in terms of their available resources, levels of development and ability to support their present population.

This unprecedented population expansion is linked to another world crisis, that of desertification—the process of degeneration of the land's productivity—which is eroding the available resources and the economic prospects of increasingly impoverished developing countries. In general, more intensive use of natural resources has led to deforestation, soil erosion, losses in agricultural productivity and consequent deterioration of the environment (Salas, 1984). Its results include the rapid increase in desertified land and accelerating loss of soil productivity, particularly in the tropical drylands and highland areas of the developing countries.

Much of the world is already unable to provide the basic human needs of food, fuel, shelter—and a future—for



Famine in Ethiopia, the human cost of desertification. (UNEP/Charles Stewart)

increasingly large numbers of its people. Over the past decade, the rapid population growth typical of much of the Third World has been associated with intensifying poverty and increase in the numbers of human beings deprived of basic human needs

even though their proportion of the total population has diminished.

Population, Resources and Development: a Balance Lost

The problem is not simply population

Desert spread and population boom

Table 1: Population size and rate of increase for the major regions, medium variant, 1980-2100, as assessed in 1980.

	Population (thousands)							Average Annual Rate of Growth (%)						
	1980	2000	2025	2050	2075	2095	2100	1980-1985	2000-2005	2025-2030	2050-2055	2075-2080	2095-2100	2100-2105
World total	4 432 148	6 118 849	8 195 066	9 513 314	10 096 544	10 193 833	10 184 962	1.70	1.39	0.882	0.358	0.100	-0.017	-0.027
More developed regions	1 131 339	1 272 159	1 376 786	1 402 357	1 419 153	1 421 662	1 421 222	0.68	0.40	0.146	0.066	0.015	-0.006	-0.006
Less developed regions	3 300 809	4 846 690	6 818 280	8 110 957	8 677 391	8 772 171	8 763 739	2.04	1.64	0.955	0.408	0.114	-0.019	-0.031
Africa	469 982	852 885	1 541 702	2 165 991	2 507 152	2 590 471	2 591 221	3.00	2.77	1.702	0.838	0.306	0.006	-0.029
Latin America	363 704	565 747	865 198	1 096 119	1 214 528	1 238 889	1 237 853	2.38	1.92	1.253	0.515	0.195	-0.017	-0.057
North America	247 835	298 805	343 544	364 188	377 986	381 371	381 897	1.04	0.62	0.319	0.222	0.058	0.031	0.026
East Asia	1 174 874	1 474 669	1 712 137	1 765 051	1 762 245	1 760 703	1 762 513	1.24	0.89	0.334	-0.027	-0.039	0.021	0.006
South Asia	1 403 736	2 074 789	2 819 265	3 197 600	3 305 578	3 294 241	3 284 347	2.17	1.53	0.768	0.296	0.014	-0.060	-0.041
Europe	483 704	512 017	522 199	508 844	503 138	503 708	503 916	0.34	0.15	-0.078	-0.083	-0.003	0.008	0.008
Oceania	22 820	29 701	36 064	40 651	41 858	42 246	42 270	1.44	0.92	0.638	0.188	0.070	0.011	0.005
USSR	265 493	310 236	354 958	375 250	384 058	382 204	380 943	0.93	0.60	0.381	0.163	-0.000	-0.066	-0.060

From: *World Population Prospects as Assessed in 1980, Population Studies No. 78, 1981* (Department of International Economic and Social Affairs, United Nations Secretariat, New York) Annex, pp 12-15; and *Long-Range Population Projections of the World and Major Regions, 2025-2150, Five Variants, as Assessed in 1980, 1981*. (Estimates and Projections Section, Population Division, Department of International Economic and Social Affairs, United Nations Secretariat, New York).

growth. It involves all the complex links between people, resources, development and the environment, and the vital need to strike a balance between them. It particularly involves the availability and depletion or destruction of natural resources, complicated by their less than optimum utilization in much of the world. This is due largely to underdevelopment and poverty which, in turn, contribute to further resource wastage and depletion.

Rapid population growth translates into increased human needs and intensified pressures on available resources. In the context of the largely rural and agricultural economies of the Third World, this means increased pressures on land, forest and water resources.

High levels of development based on efficient use of available natural resources may make it possible to support larger populations while minimizing environmental disruption. But at low levels of development, for instance in subsistence agriculture-based economies, rapid increase in human numbers creates pressures which may have serious long-term adverse effects on the land.

An important effect of rapid population expansion in the poorer developing countries has been to slow development by taking up a large share of available resources to maintain the additional population, thereby leaving fewer resources to support development efforts. At the same time it has

tended to intensify pressures on natural resources, particularly land resources.

The problem pervades all areas of the economy and of society. It means more pressure on natural resources and on the finances needed for the rational and sustainable development of those resources. It implies more strain on education, health and other services, themselves essential components of development, to extend them to the additional population, without necessarily being able to improve the quality or level of services.

Over the past two decades many developing countries have achieved significant growth in their economies, but they have often seen their hard-won economic gains consumed by the increased requirements of the additional population. The results are familiar—increasing poverty, food deficits, lack of resources for investment needed to increase land productivity or to provide alternative livelihoods for the expanding rural population and intensified pressures on land, water and forest resources.

Food Production, Population and Desertification

Nowhere are the pressures—and the destruction—more clear than in the area of food production. Subsistence farming is the basis of the livelihood of the majority of the rural population of the poorest developing countries, particularly in the drought-prone

tropical drylands of Africa, Asia and Latin America. But in most of these areas the productivity of the land and the livelihood of the subsistence farmer are rapidly deteriorating.

Globally, the world can grow enough food to adequately feed its present population and more, but much of the Third World cannot. These low-income countries with their problems of massive poverty and inadequate and highly unstable food production, share important structural and demographic characteristics. A large proportion of the population depends on agriculture for income and employment and the growth rates of population and labour force are high. This means that the decline of agriculture's share of employment is likely to be slow and that the absolute size of the farm labour force will continue to increase for many years (Mellor and Johnston, 1984).

In this situation, which prevails in much of Africa, South Asia and South and Central America, rapid population growth typically leads towards creation of a large, underemployed, rural, landless class (Mellor and Johnston, 1984). It also leads to the expansion of subsistence farming. Where there is not enough arable land, as is true of much of Africa and South Asia, this implies expanding subsistence agriculture on marginal lands that are of poor productivity, quickly exhausted, and highly prone to soil erosion and desertification.

Between 1980 and 2000, the developing countries will see the number of

young adults increase by more than 630 million, the developed countries, by merely 20 million (McNamara, 1984). But the non-agricultural sectors of the developing countries are not expanding at rates which would permit them to absorb the majority of this increase in the labour force, nor for that matter is the agricultural sector. One implication of this is a vast increase in subsistence agriculture which, considering the limited availability of arable land, implies intensified overcultivation, greatly increased cultivation of marginal and submarginal lands and consequent accelerated land degradation, particularly in dry-land and mountain regions.

Agronomists sometimes tend to take for granted the stability of ecological systems. Yet good agricultural practices are threatened by the inexorable buildup of rural populations. As cultivation is expanded to its geographical limits, but still at bare subsistence levels of production, ecological vulnerabilities are exposed (McNamara, 1984).

It is estimated that annual land losses to all types of degradation may amount to 5–7 million ha. of cropland a year, in addition to over three million ha. a year lost to non-agricultural uses in developing countries. Population growth—along with inequality and inappropriate methods of farming and forestry—is probably the major factor in land loss (Harrison, 1984).

In 55 out of 90 developing countries for which data are available, food production, the most important economic activity, failed to keep pace with population growth between 1970 and 1980 leading to a serious decline in *per capita* food output (FAO, 1983). In Africa, for instance, *per capita* grain production diminished by at least 11 percent over the 10 year period.

In 1961-1965, the developing countries grew 96 percent of their cereal requirements with net imports of only 10 million metric tons a year. But by 1978-1979 they were producing only 92 percent of their requirements and the deficit had risen to 52 million metric tons a year. In Africa, the decline in *per capita* grain production was even more serious with net imports rising from five percent of total needs to 17 percent over the same period (Harrison, 1984).

Table 2: Total population of the world and major areas according to the low, medium and high variants, selected dates 1980-2100, as assessed in 1980.

Major Areas	Variant (Millions)						
	Low	Medium	High				
World							
1980	4 420	4 432	4 441				
2000	5 837	6 119	6 337				
2025	7 168	8 195	9 135				
2050	7 687	9 513	11 135				
2075	7 662	10 097	13 355				
2095	7 552	10 193	14 103				
2100	7 524	10 185	14 199				
More developed regions							
1980	1 130	1 131	1 132				
2000	1 233	1 272	1 304				
2025	1 251	1 377	1 488				
2050	1 194	1 402	1 610				
2075	1 151	1 419	1 701				
2095	1 138	1 421	1 730				
2100	1 137	1 421	1 733				
Less developed regions							
1980	3 290	3 301	3 308				
2000	4 804	4 847	5 033				
2025	5 917	8 818	7 647				
2050	6 493	8 111	10 018				
2075	6 511	8 677	11 654				
2095	6 414	8 772	12 372				
2100	5 387	8 764	12 466				
Africa							
1980	469	470	471				
2000	756	853	886				
2025	1 109	1 542	1 850				
2050	1 341	2 166	2 998				
2075	1 385	2 507	3 934				
2095	1 364	2 590	4 383				
2100	1 354	2 591	4 444				
Latin America							
1980	363	364	364				
2000	544	566	586				
2025	761	865	984				
2050	868	1 096	1 424				
2075	885	1 215	1 767				
2095	865	1 238	1 926				
2100	859	1 238	1 948				
North America							
1980	247	248	249				
2000	284	299	304				
2025	301	344	366				
2050	294	364	405				
2075	289	378	433				
2095	287	381	441				
2100	288	382	442				
East Asia							
1980	1 174	1 175	1 175				
2000	1 436	1 475	1 519				
2025	1 610	1 712	1 826				
2050	1 611	1 765	1 933				
2075	1 576	1 762	1 963				
2095	1 565	1 760	1 971				
2100	1 567	1 763	1 972				
South Asia							
1980	1 395	1 404	1 410				
2000	1 988	2 075	2 166				
2025	2 548	2 819	3 116				
2050	2 772	3 198	3 790				
2075	2 757	3 306	4 117				
2095	2 710	3 294	4 219				
2100	2 698	3 284	4 230				
Europe							
1980	483	484	484				
2000	499	512	526				
2025	476	522	572				
2050	433	509	597				
2075	407	503	620				
2095	403	503	628				
2100	404	504	629				
Oceania							
1980	23	23	23				
2000	29	30	31				
2025	32	36	40				
2050	33	40	47				
2075	33	43	52				
2095	32	42	53				
2100	32	42	53				
USSR							
1980	265	265	266				
2000	303	310	319				
2025	332	355	381				
2050	336	375	433				
2075	330	384	468				
2095	323	382	480				
2100	322	381	480				

From: *Population Bulletin of the United Nations, No. 14, 1982* (Department of International Economic and Social Affairs, United Nations Secretariat, New York, New York); and *Long-Range Population Projections of the World and Major Regions, 2025 to 2150, Five Variants, as Assessed in 1980, 1981*. (Estimates and Projections Section, Population Division, Department of International Economic and Social Affairs, United Nations Secretariat, New York,

Desert spread and population boom

Table 3: Population in different age categories, selected years, medium projection.

	(Population in millions)			
	1980	2000	2050	2100
Age 0-14				
World	1553	1877	1959	1940
Developed regions	261	266	268	274
Developing regions	1292	1610	1690	1666
Age 15-64				
World	2620	3836	6296	6307
Developed regions	742	837	885	885
Developing regions	1877	2999	5411	5422
Age 65 +				
World	259	403	1259	1938
Developed regions	128	166	249	262
Developing regions	132	237	1010	1676

From: Calculated from the projections presented in *Population Bulletin of the United Nations, No. 14, 1982*, pp 25-26; *Long-Range Population Projections*, medium variant.

Much of the farmland in Africa and in dryland regions of South Asia and Latin America is cultivated with traditional methods of shifting cultivation based on periodically leaving land out of production for several years to allow the soil to regain its fertility. Increasing rural population coupled with loss of land through soil erosion and desertification leads to intensified cultivation of the remaining productive lands. This often involves shortening or eliminating fallow periods, leading to exhaustion of soil fertility while exposing the soil to further erosion.

The problem is intensifying as rural populations grow, increasing pressures on the land. In northern Ethiopia land scarcity has forced many farmers to virtually abandon fallow cycles, while in Nigeria, the World Bank reported as early as 1974 that, "fallow periods under shifting cultivation have become too short to restore fertility in some areas" (Brown and Wolf, 1984). In the Sahel, because of growing population pressure, farmers are reducing fallow periods, exhausting the nutrients in the soil. In the Sudan this has led to severe declines in millet yields in some areas (average 250-650 kgs/ha): but in the northern Sahel the yields are below 100 kgs per hectare (Ibrahim, 1983).

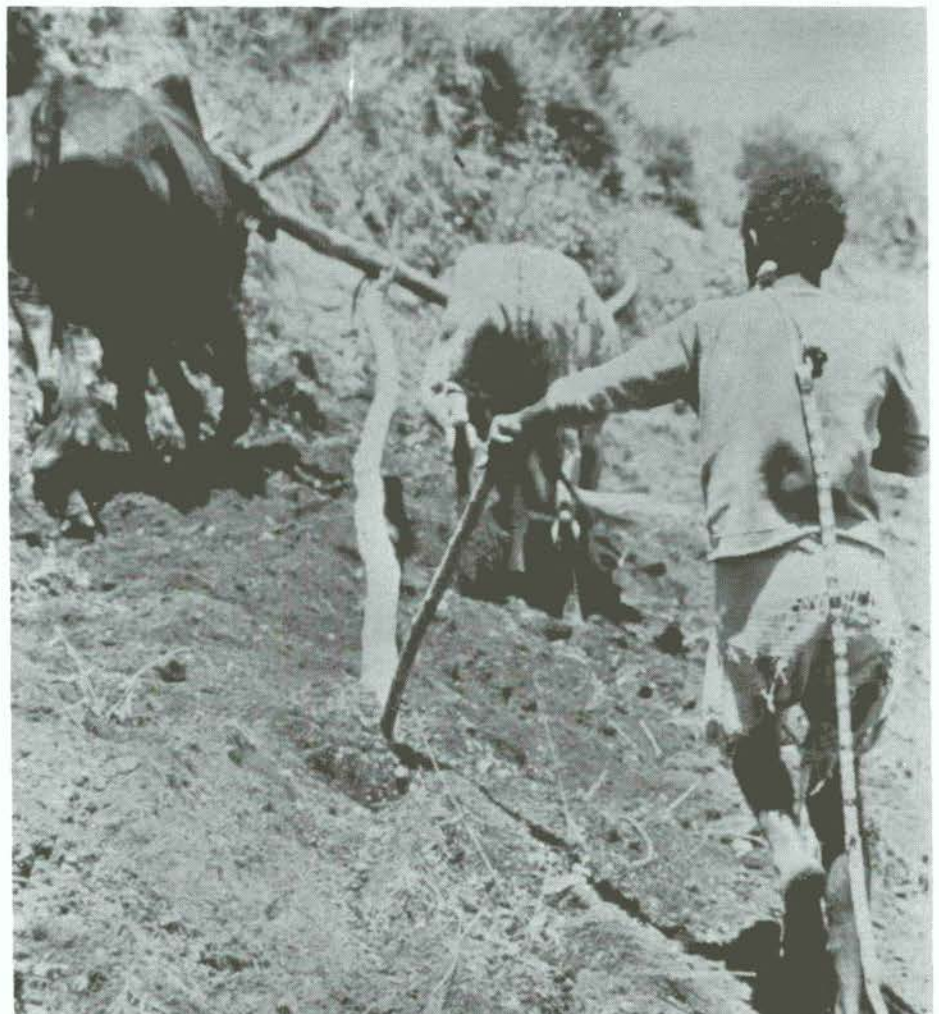
A similar situation is reflected in respect to overall economic status and production. In 1980, the developing

countries, with 75 percent of the world's people produced only 23 percent of global economic output. Eighteen percent of world output was earned by the 28 percent of the people living in the middle-income developing countries. But only five percent of total output was shared by the 47 percent of the people living in the low-income developing countries such as China, India and Sub-Saharan Africa (McNamara, 1984).

As demonstrated by the recent experience of much of the Third World, poverty and underdevelopment, in combination with rapid population growth, tend to be self-perpetuating and self-intensifying. The pressures generated tend to diminish the productivity of the land, the main economic basis for these largely agricultural countries, through soil erosion, land degradation and desertification.

The United Nations Environment Programme's (UNEP) recent global assessment of the status and trend of desertification shows that the problem is intensifying. Desertification now threatens 35 percent of the earth's land surface and the livelihood of a fifth of its population, some 850 million people. Three-quarters of the 4500 million ha. (45 million km²) that make up the world's drylands are already affected and between a half and a quarter of this area is severely affected. The UNEP study shows that the problem is spreading rapidly, affecting more land and more people (UNEP/GC.12/9, 1984).

It is a man-made problem, caused by human overexploitation of the land through overcultivation, overgrazing, deforestation and poor irrigation practices. At its roots is a growing imbalance between human numbers, available resources, development and



Rapid population growth and shortage of arable land often force the cultivation of marginal lands unsuitable for tilling like this steep hillside in northern Ethiopia. The result is accelerated soil erosion. (UNEP/Charles Stewart)

the environment. Increasing population pressures on limited available resources is exacerbating the results of underdevelopment, poverty and poor resource management.

The figures are alarming. While populations are increasing rapidly, the land resources needed to support them are steadily diminishing. Only about 1400 million ha. (14 million km²) of the earth's land surface is farmland (Tolba, 1983). But an estimated 21 million ha. is being degraded every year to near or total uselessness through desertification.

The productivity of much of the remaining land is also diminishing. The world's annual loss of precious top-soil is estimated at 25,000 million tons (Tolba, 1983). Some 1000 million tons being lost by Ethiopia alone (UN/FAO, World Food Programme, 1981). What it means is the loss of the land's fertility and according to one recent estimate, the overall loss of productivity of all rainfed croplands could be as much as 29 percent (Harrison, 1984).

This translates into a continuing and unsustainable draining of land productivity, particularly in the poorer developing countries where the subsistence farmer is unable even to partially compensate for loss of top-soil through use of expensive chemical fertilizers. As productivity diminishes, the pressures on the land often tend to increase, leading to further degradation and decline in productivity.

There are many examples—in the northern Sahel where overcultivation and expansion of millet cropping into low-rainfall zones has led to intensified wind and water erosion and rapidly diminishing crop yields—and in Ethiopia, where hillside fields in the northern highlands have been eroded down to bedrock in the course of a decade or two (Lamb and Milas, 1983).

Diminishing Arable Land

Soil erosion and desertification are destroying the world's already limited land resources. But every year there are 80 million new mouths to feed from these diminishing resources mainly in the developing countries.

The intensifying population pressures are exacerbating the problems of land mismanagement and desertification, and destroying the very resources on which any sustainable development must be based.

The situation is deteriorating rapidly. In 1975, for the world at large, arable land *per capita* was estimated at 0.31 ha. Now it is much less and according to recent projections, there will be only 0.15 ha. of arable land *per capita* by the year 2000 (El-Hinnawi and Hashmi, 1983). By 2025 there may be much less. According to FAO estimates, some five to seven million hectares a year of cultivable land are lost, and the FAO/UNFPA Land Resources Survey estimated that 544 million ha. of potential cropland, 19 percent of the total, could be lost to cultivation in the absence of long term conservation measures.

Loss of croplands means that more people must be supported by the remaining croplands. In practice it often means further encroachment of cultivation on rangelands and forests. Cultivation of rangelands by diminishing available grazing, intensifies overgrazing and accelerates rangeland degradation. Similar pressures lead, according to FAO estimates, to the clearing of some 11 million ha. of tropical forest every year, largely to obtain more land for grazing or cultivation. The result is often severe erosion, particularly in hilly or mountainous areas.

The UNEP assessment of desertification found that 3100 million ha. (31 million km²) of rangeland are already affected by desertification, 25 percent of it in Africa's Sudano-Sahelian region—the band of 21 countries across the continent from Cape Verde off the Atlantic coast to Somalia on the Indian Ocean (UNEP/GC.12/9 1984). With its high rate of population increase, generally low levels of agricultural development and use of farm inputs, coupled with its extreme poverty, the region is one of the most vulnerable and most affected by desertification.

Not only has much fertile land in Africa been rendered useless by desertification, much of the remaining area has been at least partially affected, significantly diminishing its

productivity. The assessment shows that over 80 percent of Africa's dry zone rangelands are at least moderately affected by desertification. Also affected are some 80 percent of its rainfed croplands and over 30 percent of its irrigated lands (UNEP/GC.12/9 1984).

In effect, over 80 percent of the continent's available farmland and rangeland has already lost a significant part of its productivity and the process is continuing—and accelerating. The situation is particularly severe with respect to rainfed croplands which provide the livelihood of most of the people and tend to be the most vulnerable to increasing population pressures. The combination of diminishing land productivity, rapid population growth and scarcity of new land suitable for cultivation, implies a continuing decline in *per capita* food production. It also implies accelerating encroachment of cultivation on marginal rangelands and forest areas and intensified soil erosion and land degradation.

Encroachment of cultivation on rangeland has reduced available grazing while the growth of pastoral populations has been accompanied by considerable increases in herd size. In the Sudano-Sahelian region the number of cattle rose by 25 percent between 1975 and 1984, the sheep by 37 percent and goats by 35 percent (Berry, 1984). This has led to widespread severe overgrazing, extensive range deterioration and desertification.

The forest resources of the Third World are among the prime victims of rapid population growth. In many countries in South Asia, Africa and Latin America, it has often meant intensified clearing of forests in an increasingly desperate search for more farmland. The problem is exacerbated by the need for fuel. Most of the people of the developing countries depend on wood as their main source of domestic fuel. More people means increased demand for woodfuel and intensified clearing of forests to meet that demand. UN studies show that some 90 million people already suffer from severe fuelwood shortages. According to some estimates, by the year 2000, 140 million people in the rural areas of the Third World will experience serious fuelwood shortages while

over 2,200 million people will be cutting trees faster than they are growing.

In the developing countries, high rates of population growth have been a major factor increasing the demand for fuelwood. In these countries the estimated 1300 million people who depend on firewood for fuel are cutting it faster than it is being replaced. In Tanzania, for instance, firewood has become so scarce that the average household spends 250-300 working days per year simply to gather its firewood supply (McNamara, 1984).

The problem is particularly severe in dryland areas such as the Sahel and in mountainous or hilly areas of Nepal, northern India, the Ethiopian highlands and the Bolivian altiplano. In the Sahel between 1978 and 1984, Mali lost some 10 percent of its limited forest cover. Most of the main cities and towns of the region tend to be surrounded by wide swathes of near or total deforestation.

In Sudan, the acacia forests that some three decades ago used to reach up to the capital, Khartoum, have now been cleared up to 70 kms from the city. In Niger, the denuded landscape within a 40 to 50 km radius of Niamey shows severe desertification. In Ethiopia, the north Indian plains and many areas of the Sahel, deforestation has led to severe shortages of woodfuel forcing the rural population to use animal dung and crop residues for domestic fuel. In India, for instance, an estimated 73 million tons of animal dung are burned annually as fuel (Hada, 1984).

This, in turn, robs the soil of valuable organic matter, often the only available source of crop nutrients to replace those being drained from the soil through overcultivation, further impoverishing it and rendering it still less capable of supporting its human and animal populations. But as one highland villager in Ethiopia's Wollo province pointed out: "Maybe its true that we could grow more food if we used the dung for fertilizer, but then, what would we cook the food with?" (Lamb and Milas, 1983). Throughout the Sudano-Sahelian region, in northern India and elsewhere in the world's tropical drylands, there are millions of other villagers who share this same dilemma—and the numbers are rapidly growing.



Severe erosion in Ethiopia's northern highlands. Only 20 years ago this field had deep and fertile soil. (UNEP/Charles Stewart)

Throughout the tropical drylands, deforestation is a rapidly intensifying problem, destroying the ground cover over large areas and leaving the land vulnerable to drought and soil erosion. As a result, in regions like the Sahel, vast tracts of land are being transformed into "dust bowls" with diminishing water tables and drying streams and water-holes. Once the soil has lost its protective plant cover it is washed away by tropical downpours or carried away by strong winds which reach extremely high speeds once the braking effect of the trees is no longer there. Under the pressure of expanding human and animal populations, forest cover in dryland areas has decreased significantly since 1977 (Berry, 1984). This has led to severe land degradation, increasing soil erosion and diminishing land productivity.

The combined effects of drought, land degradation and the extension of agriculture into increasingly marginal lands, are sapping the productive potential of the world's drylands. All these effects are exacerbated by the

pressures of expanding populations. In turn, they lead to intensified land degradation and further encroachment of cultivation and grazing on ever less suitable and more marginal lands. It is a vicious circle and a deteriorating one with no end in sight.

The basic need is for better resource utilization—and the means with which to achieve it. But in today's Third World, it is the means that are sparse, and demographic pressures are a significant limitation on efforts to increase these means. With the right technologies, adequate inputs and good resource management, the same piece of land can support many more people while putting less pressure on often fragile ecosystems.

For instance, between 1978 and 1984 the population of the Sudano-Sahelian region increased from 191 million to 230 million (Berry, 1984). But a recent UN study shows that most of the region is incapable of supporting on a sustained basis, even the much smaller number of people—less than 190 million that it had in 1975

(Harrison, 1983). That, however, is in terms of the prevailing subsistence farming economy involving a minimum of farm inputs, traditional land-use systems, seeds and crop mixes and no conservation measures. But according to the same study, with a moderate level of farm inputs, improved seeds and simple conservation measures, the region could support not only its present population, but also the 406 million people who will live there by the year 2000.

It is a question of development. But many developing countries find it more and more difficult to invest in development as increasingly large slices of their meagre resources must be used to support the additional people in their rapidly-growing populations.

Africa: A Taste of What Can Happen

All the Third World's problems of rapid population increase, intensifying poverty, underdevelopment and imbalance between population, available resources, development and the environment are present in Africa, along with the results of those problems, deforestation, soil erosion, loss of land productivity and desertification. In Africa, all these are accelerating.

Over the 1970s and since, the world has already been given a taste of what can happen—intensifying poverty and rapidly growing food deficits. Where drought has been added to existing problems of diminishing productivity, the result has often been famine.

Severe drought was the immediate cause of Africa's current food crisis, but the drought-triggered famine is merely an outward symptom of much deeper problems that have led to increasing deterioration of the African food economy over the past decade and more. There are five basic causes that contribute to this decline, unprecedented population growth; widespread environmental deterioration, particularly desertification; chronic underinvestment in agriculture, food pricing policies that act as disincentives to farmers, and a growing tendency to divert some of the best agricultural land to the production of cash crops for export. These problems

Table 4: General fertility rates for major world regions, 1950-2025, as projected⁺

Region and subregion	General fertility rates*			
	1950-1955	1975-1980	1995-2000	2020-2025
World	150	119	94	72
Africa	203	203	174	98
Eastern Africa	205	213	191	106
Middle Africa	191	194	174	102
Northern Africa	201	187	138	79
Southern Africa	168	167	147	89
Western Africa	218	219	192	103
Latin America	180	143	106	85
Caribbean	159	117	93	81
Middle America	209	174	114	78
Temperate South America	108	90	75	63
Tropical South America	195	146	110	92
North America	101	64	56	61
East Asia	159	87	63	56
China	170	90	62	56
Japan	92	56	58	60
Other East Asia	153	108	74	60
South Asia	196	160	106	66
Eastern South Asia	185	147	92	62
Middle South Asia	200	164	108	65
Western South Asia	199	176	132	79
Europe	77	60	54	59
Eastern Europe	89	70	59	61
Northern Europe	68	55	51	58
Southern Europe	80	66	57	59
Western Europe	69	49	49	60
Oceania	117	91	75	67
Australia-New Zealand	98	69	59	62
Melanesia	195	192	131	77
Micronesia-Polynesia	210	144	97	68
USSR	88	70	66	66

* Annual number of live births per 1000 women aged 15-49 years.

+ Based on Demographic Indicators of countries, Estimates and Projections as assessed in 1980, United Nations, Department of International Economic and Social Affairs Sales Publications ST/ESA/SEP/A/80.

and their interaction also contribute directly or indirectly to further land degradation and loss of productivity.

The problems may be more serious in Africa than in some other Third World regions because, to a greater degree than in any other region, the fertility of the people is outstripping the fertility of their land in an area where the level of development is low and nearly all economic production is directly or indirectly related to the productivity of the land.

Africa was late to recognize that rapid population growth could pose an obstacle to development. Only a decade ago most African leaders tended to think that population increase would aid development. They were thinking in terms of the continent's comparatively low population to land ratios and tended to overlook the fact that only a small proportion of

Africa's land is arable. In Kenya, for instance, barely 20 percent of the land is classified as arable. The remainder, in the absence of heavy investment in irrigation and other expensive inputs, is at best useable for grazing.

The experiences of the last decade have demonstrated conclusively that available arable land and high rates of population growth tend to limit development in much of the continent. With more people on less good land there have been persistent *per capita* declines in both food production and real income. The need for investment in development is well-recognized. But declining *per capita* income has meant that there is little left for investment. The result has been economic stagnation and decline, exacerbated by the external pressures of an unfavourable world economic order.

In Africa, as elsewhere, attitudes towards population growth are changing. Economic and environmental pressures now make it clear that rapid population expansion in combination with underdevelopment and accelerating desertification constitutes a very real threat to the future development and stability—possibly even to the survival—of many African states. In January 1984 at the ECA-sponsored Second African Population Conference, representatives of 44 African nations acknowledged population policy as a central component of development planning and endorsed government commitment to family planning programmes. In effect, most African states now recognize that there is a serious threat and that something must be done.

Population Planning, Development and Combating Desertification

Population planning should be seen as a dynamic component of the overall process of economic and social development. Population growth is a key factor in the population-resources-development-environment equation and must be taken into account in long-term planning for development, desertification control and other aspects of environmental conservation. But while easing demographic pressures is essential, any realistic efforts to halt desertification must also address in an integrated way, the problems of development, conservation and provision of basic human needs.

Human activities cause desertification and human action can halt it. Desertification and use of appropriate technological advances are key factors in doing so. Improved land use and better farming methods with increased inputs can raise the carrying capacity of land—the (number of) human and animal population that it can support on a sustained basis—thus relieving the excess population pressures that often lead to desertification.

Essentially, halting desertification requires restoring the balance between man and land—between population size, available resources and the environment. Development and improved technology through making better use of resources, can help in relieving pressures and restoring this

Table 5: Several Low and Middle Income Countries Affected By Desertification

	Population Projection by Countries Affected by Desertification						TFR	GNP/capita	Percentage of married women of childbearing age using contraception	
	1950	1980	2000	2025	2050	2100			1982	1970
Low-income Economies										
Afghanistan	8	16	25	41	55	71	8.0	—	2	—
Benin	2	4	7	12	18	22	6.5	310	—	17
Burundi	3	4	7	14	20	26	6.5	280	—	—
Central Afr. Republic	1	2	4	7	10	13	5.5	310	—	—
Chad	3	5	7	12	17	21	5.5	80	—	—
China	603	908	1196	1408	1450	1462	2.3	310	—	69
Ethiopia*	16	31	57	110	164	220	6.5	140	—	—
Ghana	4	12	24	47	66	81	7.0	360	—	10
India	362	687	994	1309	1513	1632	4.8	260	12	28
Kenya	6	17	40	83	120	149	8.0	390	6	7
Pakistan	37	82	140	229	302	361	5.8	380	6	—
Mali	3	7	12	21	31	40	6.5	180	—	—
Rwanda	2	5	11	22	34	45	8.3	260	—	—
Middle-income Economies										
Cameroon	5	9	17	34	50	63	6.5	890	—	2
Egypt	20	42	63	86	102	111	4.6	690	—	24
Ivory Coast	3	8	17	32	44	56	7.0	950	—	3
Lesotho	0.8	1	2	4	5	7	5.8	510	—	5
Nigeria	41	88	169	329	417	594	6.9	860	—	6
Senegal	3	6	10	19	26	34	6.5	490	—	4
Sudan	9	19	34	61	86	107	6.6	440	—	5
Zimbabwe	2	7	16	34	49	61	8.0	850	—	15

+ a Total Fertility Rate
 * Ethiopia's recent census indicates a 1984 population of 42 million.

NOTE: Where percentage not given it was either unavailable as in the case of Zimbabwe (1970) or negligible as in the case of most of the countries of the Sudano-Sahelian zone listed above.

SOURCE: 1950 UN estimate. Other years World Bank 1984 estimates and projections, and "World Development Indicators" in *World Development Report 1984*.

equilibrium. But in the long term, population growth must be brought into line with the realities of resources, development and the environment. As Leon Tabah, Director of the UN Population Division says, "it is conceivable that some limits have ultimately to be set on (global) population growth". The indications are that the alternative may be disaster.

Recognition of this—and concern—is growing in the developing countries. Sixty percent of the developing countries with 80 percent of the population of the Third World, have adopted specific population policies aimed at slowing their rates of population increase, mainly through the provision

of family planning services (Salas, 1984). In most cases these services are delivered through health services linked to maternal and child health or primary health care programmes.

Slowing Population Expansion

Concern about the implications of rapid population expansion has spread through the main regions of the Third World. In Africa, with the highest rates of population increase, in the past little attention was given to the problem. But the "Kilimanjaro Declaration" by the 44 African states attending the Second African Population Conference (Arusha, Tanzania) in January 1984, reflected growing concern in its call for "achievement of

population growth rates that are compatible with the desired economic growth and social development goals”.

Recognizing the problem and doing something about it are two quite different things. Population growth has its own inherent momentum, and changing its direction is a slow process. But the experience of several developing countries shows that it can be done. The findings of the World Fertility Survey in 20 developing countries indicate a large discrepancy between actual fertility and desired fertility. In 17 of the countries surveyed the average number of “children ever born” ranged from 3.8 to 8.3, while the average number of children desired, varied from 3.7 to 4.7 (Salas, 1984).

The rates of contraceptive practice ranged from as low as two to five percent in some countries having fertility-reduction policies, to 71 percent of currently married women in Singapore (Salas, 1984). This implies that significant reductions in fertility could be achieved through better access to contraceptive services and family planning information for those women who, according to the survey, would prefer to have fewer children.

According to the United Nations Fund for Population Activities (UNFPA) one key problem has been lack of access to effective family planning services. UNFPA says that the overall delivery of these services “has not been completely satisfactory” in most cases (Salas, 1984). To improve access and delivery, many developing countries have initiated complementary programmes including educational and information campaigns which have increasingly involved non-governmental organizations.

The past reluctance of some countries to pursue vigorously policies of fertility limitation stems at least in part from fear of a religious and political backlash. But this fear would appear to be exaggerated. The cases where it has happened are few and far between. One reason might be that practically every major religion emphasizes responsible parenthood. Another is that family planning is not an alien concept to the people of the developing countries. In a major statement calling for a new commitment to population

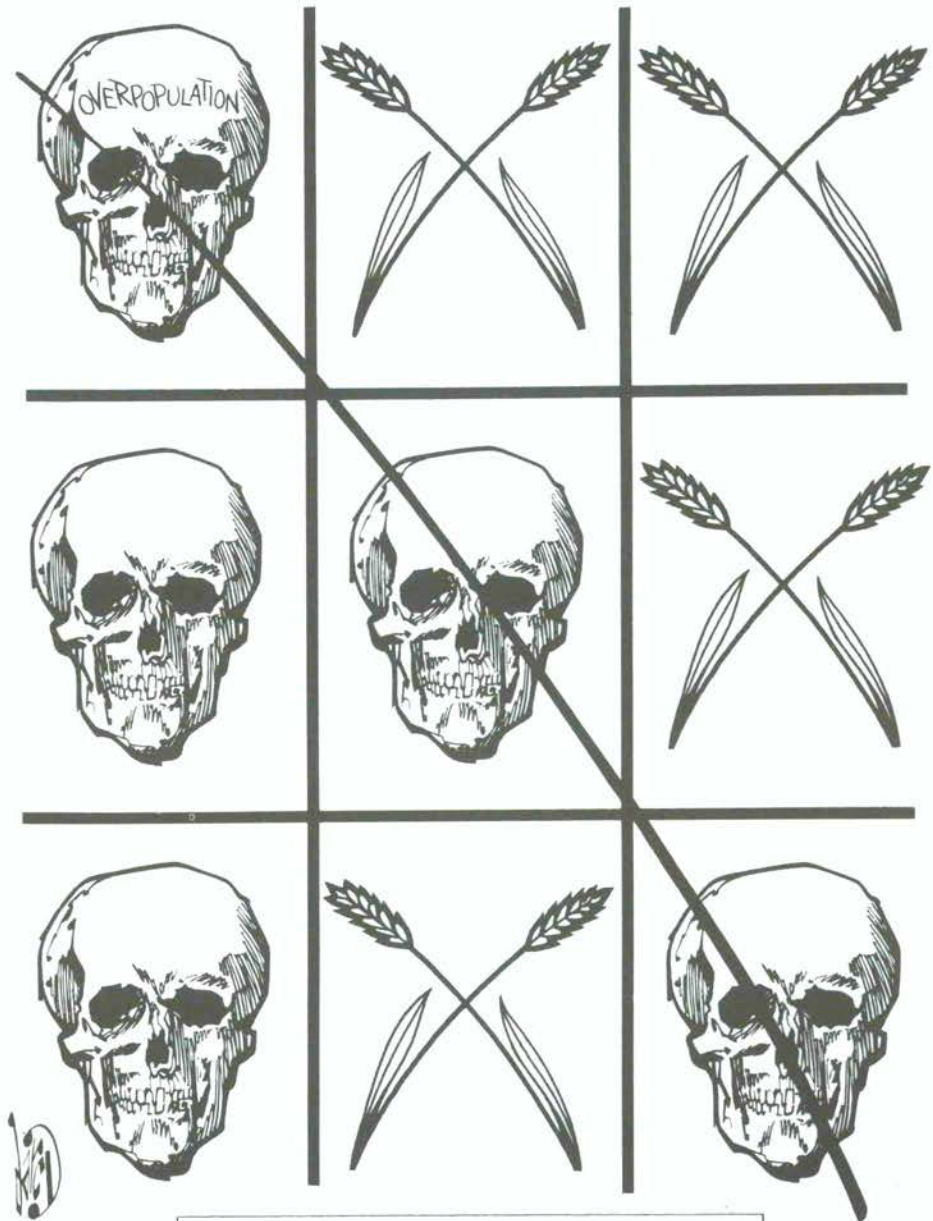
control, Kenyan Vice-President Mwai Kibaki has said, “we must counter any African who says that family planning is foreign. Because the programme is African.”.

In most of the developing countries, family planning has had very limited success in limiting population growth, even in countries with official policies aiming at lowering fertility. But there are notable exceptions that show that such programmes can work.

Developing countries with as varied socio-economic systems as Cuba, South Korea, Mauritius and Mexico have introduced programmes well-

adapted to local and national needs. The hallmark of each programme has not been coercion but voluntary involvement. This has been an essential element in successes in family planning in such societies as Indonesia and Thailand, based on promotion of a social consensus favouring a smaller family norm and on provision to families of modern means of fertility regulation to help them in achieving that norm.

In India, the State of Kerala, for example, has shown considerable progress in slowing the birthrate through a state-wide education and family planning programme. In the



Cartoon by Tom Darcy
Winner of First Prize • 1976 Population Cartoon Awards

1960s Indonesia launched a transmigration programme that was almost counter balanced by a population growth rate that stood at three percent in 1969. But with strong government support, a village level programme reduced that rate by nearly half by 1983. Villagers were given inducements in the form of new schools, irrigation pumps and so on to encourage them to practice family planning. There is evidence that family planning knowledge and practice as it spreads, tends to reduce social obstacles and create further demand. In Thailand, for instance, in 1970 only 14 percent of the female population used some form of contraception, by 1981 the proportion had risen to 60 percent.

Governments aiming at reducing their rates of population growth can take a number of possible actions divided into two broad categories: those designed to encourage parents to desire smaller families and those designed to provide them with the means to achieve that desire, (McNamara, 1984). The experience of the past decade indicates that both approaches are necessary and that success depends largely on the extent to which each line of action is achieved and integrated with the other.

The Need for a Balance

We now know that a society can do a great deal to influence the direction and rate of its population change through planning and actions calculated to integrate population change with resources and development. We also know that it is not an easy matter. It is rife with social, economic and political complications, but where determined efforts have been made, they have brought results.

The spur to action is the fact that population growth cannot be separated from resource management, and the certainty that unless the world's finite resources are managed more fairly and more wisely, economic and political chaos will follow. There can be no doubt that the sheer weight of human numbers combined with resource mismanagement can destroy the web of life which ultimately supports the economies of every country. This is particularly true in the tropical drylands of the Third World, where poverty and underdevelopment exa-

cerbate the imbalance arising from rapid population growth, and diminish the possibilities of rational resource management.

Desertification is only one of the areas where this is apparent. But it is one where rapid population growth, mismanagement of resources and consequent imbalance between population, resources, development and the environment, already threaten a new world crisis. For desertification is a life and death matter—today, for the hungry millions of the Third World's drylands—in the long-term, for everyone.

REFERENCES

- Berry, Leonard, with UNSO: *Assessment of Desertification In the Sudano-Sahelian Region 1978-1984*. UNEP/GC.12/Background paper, United Nations Environment Programme, 1984, Nairobi.
- Brown, Lester R. and Wolf, Edward, "Food Crisis in Africa". *Natural History* 6/1984.
- Collins, Peter, "Forests for our Future", *Development Forum*, United Nations University and the Division for Economic and Social Information/DPI, Vol XII, No.4, May 1984, New York.
- El-Hinnawi, Essam and Hashmi, Manzur H., *Global Environmental Issues*, UNEP 1982.
- Hada, Nurul, *Development Forum*, United Nations Division for Social and Economic Information/DPI and UN University Vol XII, No.6, July-August 1984, New York.
- Harrison, Paul, "Land and People, The Growing Pressure". *People* Vol.10, No.1, 1983, International Planned Parenthood Federation, London.
- Harrison, Paul "Population, Climate and Future Food Supply". *Ambio* Vol.XIII, No.3, 1984, Royal Swedish Academy of Sciences, Stockholm.
- Ibrahim, Fouad, "The Fight Against the Desert", *Development and Co-operation*, German Foundation for International Development.
- Lamb, Robert and Milas, Seifulaziz, "Soil, Erosion, Real Cause of Ethiopian Famine", *Environmental Conservation*, Vol.10, No.2, Summer 1983. Foundation For Environmental Conservation, Geneva.
- McNamara, Robert S., "Time Bomb or Myth: The Population Problem". *Foreign Affairs*, Vol.6, No.5, Summer 1984, Council on Foreign Relations, New York.
- Mellor, John W. and Johnston, Bruce F., "The World Food Equation: Interrelations Among Development Employment and Food Consumption", *Journal of Economic Literature*, Vol.22, June 1984.
- Salas, Rafael, "Population, Resources and the Environment: some Crucial Issues at the Conference on Population, *Ambio*, Vol XIII, No.3, 1984, Royal Swedish Academy of Sciences, Stockholm.
- Tolba, Dr. Mostafa, *Earth Matters*. United Nations Environment Programme, 1983, Nairobi.
- UN Department of International Economic and Social Affairs, "World Population Prospects as Assessed in 1980", *Population Studies* No. 78, 1981, United Nations Secretariat, New York.
- UNEP/GC.12/9. *General Assessment of Progress In The Implementation of The Plan of Action To Combat Desertification*, 1984, Nairobi.
- UN/FAO, *Tropical Forest Resources*, FAO Forestry Paper No.30, 1982, Rome.
- UN/FAO World Food Programme Interim Evaluation by WFP/FAO/ILO Mission of Project Ethiopia 2488 'Rehabilitation of Forest, Grazing and Agricultural Lands' and Appraisal of the Expansion Request, World Food Programme, 1981, Rome.
- UN/FAO, *State of Food and Agriculture 1982*, FAO, 1983, Rome.

Ecological villains or economic victims: the case of the Rendille of northern Kenya

Michael O'Leary

Introduction: the Rendille and their herds

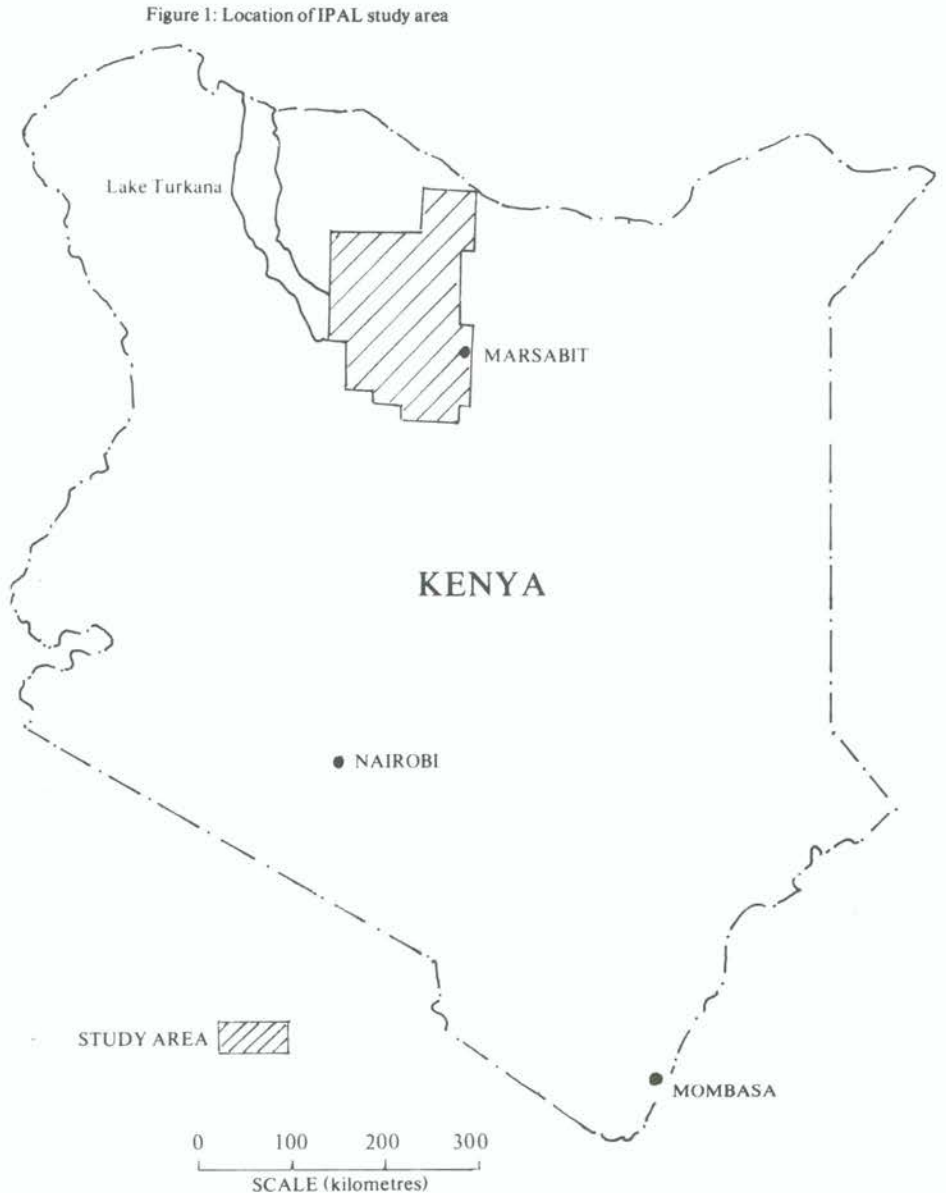
The Rendille occupy mainly arid lands with an average annual rainfall between 200-300 mm. They obtain their livelihood principally from keeping camels, sheep and goats, and in recent years cattle. The Rendille one-humped camel is smaller and more robust than the Somali dromedary (Musaka-Mugerwa 1981:8). Their sheep are of the Somali fat-rumped breed and their goat is the small East African species. Borana and Zebu breeds constitute their cattle herds. In 1919 the population of all the Rendille people was 5,474. According to the national population census of 1979 their population was 21,749. This gives an annual increase of 2.3% between 1919-1979. Due to droughts in the late 1960s and early 1970s the Rendille lost large numbers of livestock of all species either through forced slaughter for meat, forage shortage from depleted rangelands or animal diseases frequently caused by inadequate feeding. Famine relief programmes helped to provide sustenance for the human population. The net result was an overall drop in the ratio of animals to people. Livestock numbers have not kept in pace with even a modest population increase. The mean size of Rendille household herds and flocks are as follows (1):

camels	14.1	(S.D. =12.8)
cattle	7.9	(S.D. =12.4)
sheep	86.9	(S.D. =77.4)
goats	70.2	(S.D. =64.8)

The Rendille have access to at least 14,259 sq. km (2) of range which according to IPAL range and livestock scientists is able to provide adequately for their stock (IPAL 1982 Vol. 1:E-G).

Truncated Use of the Range

Over an area of 11,300 sq. km of Ren-



dille country the following mean densities have been calculated:

camels	1.65 per sq. km
cattle	2.17 per sq. km
small stock	9.52 per sq. km

(IPAL 1982: 236)

It has been estimated for the IPAL study area (3) that 16-21% of the area is overstocked and 11% of usable rangeland contained no domestic livestock between July 1976-August 1979

(Field *et al* 1983: 105). This imbalance in the grazing use of the range is paralleled by a similar skewness in the utilization of the range for building material and livestock enclosures, and for firewood. The areas surrounding trading centres have long lost an adequate tree cover due to local demands for firewood and fencing material. In addition, areas surrounding regularly used sites for main and satellite (*forr*) camps are greatly denuded of tree cover.

Following a Path of Least Effort

The uneven grazing use of the range is related to two main factors. Firstly, the Rendille follow the line of least effort when seeking out dry season grazing sites and thereby overuse certain areas year in year out. For example, in dry seasons they tend to opt for sites which are close to either springs (viz. Korole), relatively shallow waterholes (viz. Bagazi) or waterholes in or close to settlements (viz. Korr). This strategy makes the task of watering all the more easy. For example, at Korole no labour is involved in watering beyond the supervision of animal traffic to and from the springs. At Bagazi shallow waterholes lighten the work load of the herders and livestock owners. In settlements such as Korr livestock owners who normally reside there and are not themselves herders add their labour to that of the herders in establishing waterholes and in watering livestock from them. Herders only move their livestock to areas where waterholes are deep and where they themselves must contribute most of the necessary labour when their stock have used up the forage at grazing sites of easy water. At present the Rendille cannot financially afford to install and maintain more advanced water technology which would find water at deeper levels and make their task of watering livestock easier.

Another major concern of livestock owners and herders is providing security for themselves and their animals. In this they also opt for the easier way. They continue to remain in areas that are least likely to be attacked by raiders and will only move to areas more vulnerable to attack when either the water or forage supplies of the former areas become inadequate.

Preoccupation with how best to provide water and security is heightened in households who for one reason or other rely mainly on girl or women herders. In many instances labour migration and schools have taken boys and young men away from herding to be replaced by girls and young unmarried women.

The Impact of Settlement on Range Use

The emergence of permanent settlements is the second factor which has



Kargi town, a barren spot that has been desertified by permanent settlement of pastoralists around it. The pastoralists settle because of available water, shops and security. (UNEP/Daniel Stiles)

contributed to the uneven use of the range. The celebration of family rituals such as the *sorio* and *almadho* are important events for the Rendille. Usually it involves bringing back to the settlements most of the livestock for periods of one to four weeks. At other times where possible livestock owners like to keep some milch animals near at home in the settlement. These two practices lead to the over-use of the range surrounding the settlements. The damage to the range is all the more devastating when the settlement is also a major water source for livestock. This in part explains why the range surrounding Korr is more extensively denuded than that which encircles Kargi (4). However the Rendille minimise the adverse ecological effects of sedentarisation by sending most of their stock most of the year to satellite camps.

In Rendille country there are four major permanent settlements, namely, Kargi, Korr, Loglogo and Laisamis. Approximately 45% of the Rendille live in or close to these settlements. Minor settlements exist

at Ngurunit and Ilaut. These settlements are a permanent feature of the landscape and can be construed as mixed blessings. On the one hand they provide their inhabitants with easy water which lightens the task of women who are primarily responsible for drawing water for domestic use, shops in a time where reliance on shop bought food is increasing, schools and dispensaries (or health centres). In addition major settlements are important centres for government and church administration and this provides "town" residents with security from attack and a promise of food in drought years. The latter consideration is highly important to destitute and poor households who have few stock and are unable to live solely off their drought depleted herds.

Resource Management Perspective/Anthropological Approach

The statement of the problem so far is double-edged. On the one hand those who view affairs mainly from a resource management perspective can

quickly point to how the truncated use of the range is devastating the vegetational cover of over-used areas, particularly those which surround settlements (permanent or semi-permanent) and/or permanent waterpoints. In this perspective the Rendille pastoralist can be easily viewed as a villain and his actions towards his natural resources as irrational. On the other hand one can attempt to view matters through the eyes of the Rendille and assess how rational his choices and actions are from his point of view. This may be referred to as the anthropological approach. It has nothing to do with paternalism (kind or unkind) and does not in any way question the concern of those committed to the proper management of natural resources. Rather it casts a different light on these concerns (5). Outside of the question of sedentarisation the main problem is to ascertain the rationality (or irrationality) of the herding strategy of pursuing "the line of least effort". Since this brings up issues relating to the nature of the Rendille pastoral economy and its links with the wider economy as well as the impact of national policy on pastoral societies, these must be dealt with first before proceeding.

The Peasantisation of the Rendille Pastoral Economy

In a sense it is mystifying to refer to the Rendille pastoral economy as a subsistence economy. It begs the question and releases the researcher all too easily from the task and responsibility of examining the conditions which maintain the Rendille at subsistence level (or at a low standard of living). It is more illuminating to view their economy as a peasant economy. A peasant economy has the following characteristics: a heavy reliance on household labour in production, production for home consumption as well as for the market, variation in household land and livestock holdings and hence a variation in household wealth. Peasant economies are not isolated entities but are linked with national economies and politics which normally dominate them.

The day when the Rendille could totally and directly depend on livestock production for their livelihood has long past. The decline in the livestock/human population ratio first

moved them to an indirect reliance on their stock. In other words, livestock were sold on the open market in order to purchase cereals. This shift in their economy took place in the 1940s. Nevertheless they continued to rely totally (although indirectly) on livestock and its products. However, this indirect mode of reliance proved inadequate in the late 1960s and early 1970s when the livestock/human population ratio further declined. Supplementary sources of livelihood were sought in labour migration, cultivation, the sale of milk and firewood, particularly to the residents of Marsabit Town, the district headquarters.

Since the Rendille depend greatly on the wider economy (both district and national) for their livelihood it is necessary to examine the nature of their links to it. Lack of education tie the majority of Rendille job seekers to low paid jobs. Poor market facilities frequently condemn them to selling cattle and small stock at between a half and a third of the going price fetched for these livestock in Nairobi and Mombasa (6). To cover their risks local livestock traders monopolise the market and thereby keep prices at a low ceiling. The Rendille have no market outlets for their camels (cf Njiru 1983). They have to pay for foodstuffs at price levels similar to that pertaining in urban areas, while at the same time they are forced to sell their own products at price levels much lower than that which exists in urban markets. In other words, terms of trade with the wider economy are unfavourable to the Rendille. Under such circumstances they refrain from placing their livestock on the wider market except as a last resort and in times of great need when cash is required for necessities. This reluctance to sell is primarily caused by the state of the market and not by cultural considerations. Those who say that pastoralists are reluctant to sell because their needs are few are putting the cart before the horse. In a situation where the market is uncertain and prices low the pastoralist learns to aim only for a subsistence standard of living, otherwise he would risk the very livelihood of his household. Sufficient evidence exists to indicate that once pastoralists are guaranteed a stable market and good prices they do not hesitate to sell and indeed im-

proved marketing can cause major changes in the life style, social organisation, herd management practices and economy of pastoralists (cf. Barfield 1981).

The tendency for pastoralists to maximise their herds is motivated mainly by the desire to reap gains in good years as a buffer to losses in drought years. It is encouraged in circumstances where market facilities are inadequate and alternative sources of investment are lacking. Where rich pastoralists can invest in agricultural land, trade, permanent property etc. they do so (cf. Dahl 1979, Barth 1961). Already there are signs that the Gabra and Rendille are investing in agricultural land on Marsabit Mountain. This gives them an opportunity of investing other than on the "hoof". However, as long as livestock prices remain low this tendency will be inhibited due to lack of ready cash.

Government Policy

It is unnecessary here to examine colonial policies towards pastoral groups in Northern Kenya. Between 1963-67 the new independent Kenya Government was preoccupied mainly with quelling guerilla activity in Northern Kenya. It could only concentrate on development activities after 1967 when the Dar-es-Salaam agreement brought the conflict to a formal end. Somali and Maasai pastoralists have benefitted to some extent from the First Livestock Development Project (1968-1973) and the Second Livestock Development Project (1974-1982). However, the main focus in these national projects was on ranching and cattle production. The development needs of the pastoral economies of the Rendille and Gabra were not considered. Their only role in the national plan was to contribute immature cattle to the ranching community and even this operation was conducted on an irregular basis and sometimes even in an haphazard fashion. Little cognisance was taken of the fact that the Rendille kept mainly camels and small stock, animals which are most suited to their arid lands. The exclusion of the Rendille from the main thrust of the livestock projects means that they still lack adequate veterinary services and a suitable network of waterpoints, and adequate markets for their livestock have yet to

be developed. A restrictive policy towards the export of livestock coupled with a cheap meat policy for home consumers keeps livestock prices low and denies the Rendille adequate return on what they produce and sufficient funds to develop their livestock economy.

Lack of Incentive in the Local Economy

This discourse on the pastoral economy of the Rendille and its linkages with the wider economy and policy

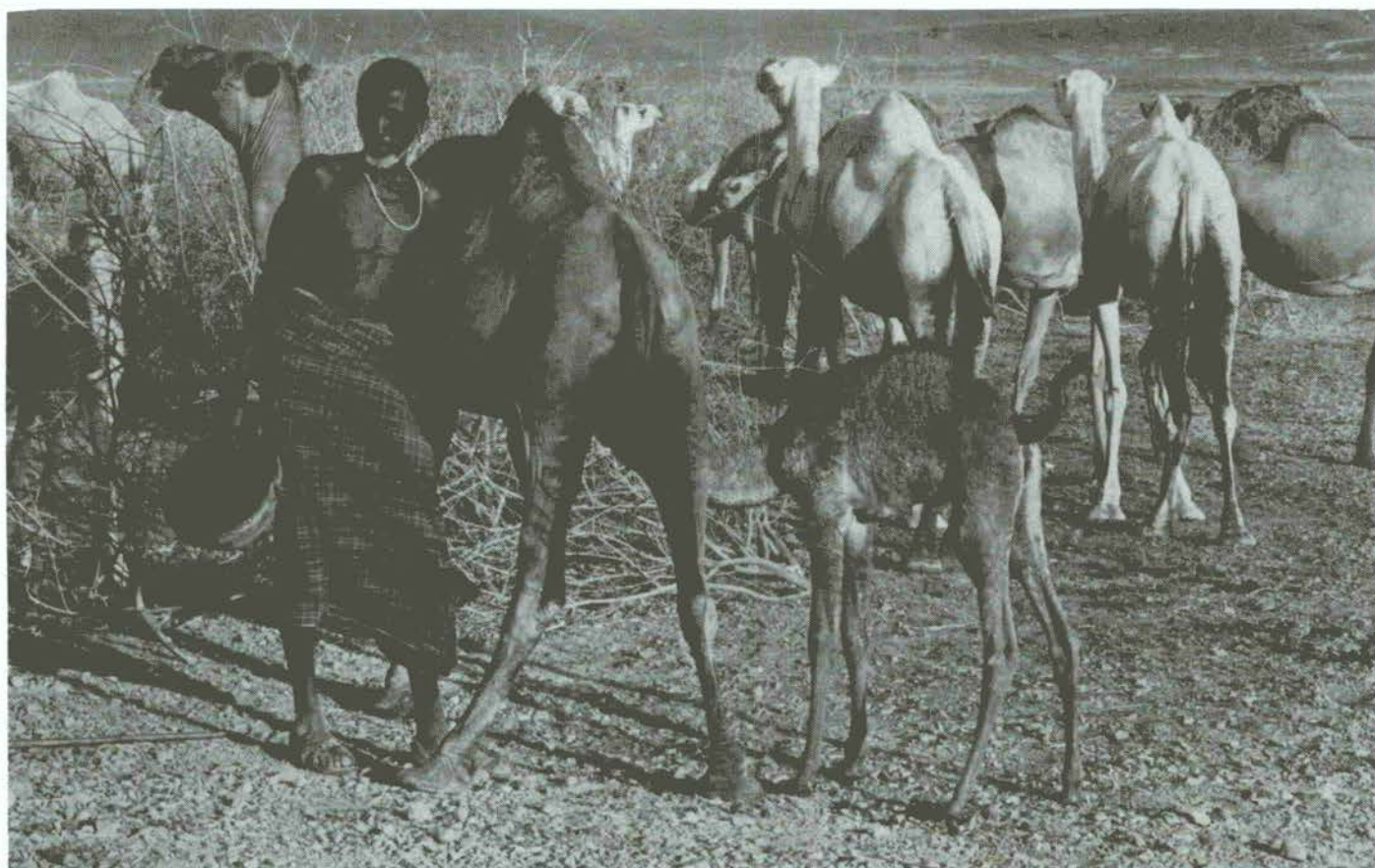
their young, leaving some milk for home consumption, he finds it unnecessary to move to better grazing sites which involve an increased watering work-load and greater risks of losing animals to raiders. In this view the law of diminishing returns applies. Under present marketing conditions the marginal improvement to the condition of his animals does not justify the increased work load or the greater risks involved.

In conclusion, poor market facilities and low prices have stunted growth in

to maintain water pumps, commercial wood-cutters capable of transporting fuel and building material long distances etc.

Dependent or Self-Sustaining Development

The above arguments lay the basis for reconciling and integrating the management of natural resources viewpoint with the anthropological approach. The adherents of both perspectives aim at a more rational use of the range. The problem is how best to



Camel's milk is the most important food item for the Rendille. Here a man prepares to milk a camel. (UNEP/Daniel Stiles)

sets the context for understanding their herding strategy of pursuing a line of least struggle.

Increasing livestock numbers rather than maximising in terms of meat and milk production of individual animals or of the whole herd is his primary goal. No doubt he is concerned with the condition of his animals but he knows that it is subject to seasonal fluctuations. As long as the lactating animals' supply of milk is close to average and is adequate to sustain

the Rendille pastoral economy and prevented any take-off above subsistence level. As a result the economy is poorly monetised and little specialisation occurs. There are no inbuilt incentives to maximise production through investing extra labour in opening up new waterpoints and grazing sites, and in investing in veterinary services other than in a limited way. Their economy is unable to afford specialists in non-herding occupations such as tradesmen to build cement lined and permanent wells, mechanics

achieve this goal. One solution is to forbid the Rendille from using overgrazed range and to open up alternative grazing for them by extending the present network of waterholes. Wood harvesting could be regulated and limited to those areas with sufficient woodland, and the wood transported to major Rendille settlements. This solution would undoubtedly have a measure of success but it lays an emphasis on having an outside agency to do things for them and hence perpetuates dependency. What happens when the

agency withdraws as it eventually must?

An alternative way suggests going beyond an examination of the symptoms of range mismanagement and sets the problem in a wider context. It recommends that the Rendille be provided with a functional market system which would guarantee good prices on a regular basis. This in the long run would maximise production by providing livestock owners and herders with incentives to go beyond a strategy of least effort in seeking suitable grazing sites, in extending the network of waterpoints, and in treating sick and weak animals. It would also greatly monetise their economy, improve their standard of living, and open the door for specialists such as tradesmen, veterinary technicians, mechanics, commercial wood-cutters and hauliers. In such a setting the Rendille could mobilise local resources while having the wherewithal to operate according to principles of proper livestock and range management. This would also enable them to relate to the wider economy not as dependents but as equal trading partners. This solution has the advantage of being self-sustaining and is workable even after the external agency has left.

*I wish to acknowledge my indebtedness to Messrs Peter Geikuku, Leiti Galborana, Augustine Nyayaba and John Rigano who acted as my field assistants amongst the Rendille. All are themselves Rendille and were employed as field assistants by the Integrated Project in Arid Lands, Unesco.

(1) The figures on livestock densities on the range were derived from the research of the IPAL livestock ecologist who used well established aerial and statistical techniques in his work. His results give a measure of the livestock use of the territory surveyed but may not provide a true measure of what numbers of livestock Rendille households own for two reasons. Firstly, frequently the livestock of non-Rendille also use what is regarded as Rendille rangeland. For example the Samburu of Karare send many herds of cattle on to the north-western slopes of Marsabit during wet seasons. Secondly, Rendille owners at times move out of their home rangelands (and the area surveyed by the livestock ecologist) large numbers of livestock. This happens particularly in dry years and hence these stock go uncounted in the aerial surveys. On the other hand the human ecology team counted on the ground the livestock holdings of individual Rendille households using anthropological techniques. The team followed up all herds of households studied even when these herds were grazing outside the boundaries of the aerial surveys. The team did not include the herds of non-Rendille households using the Rendille range. The results of the human ecology

programme provide a measure of the stock holdings of Rendille households but not a true measure of the stock use of the range. It follows that there are no inherent contradictions between the two sets of statistics presented in this paper as may appear to be the case at first glance.

(2) This figure was obtained by deducting from the total area of Laisamis Division the areas of Loyangalani and Mt. Kulal locations mainly occupied by non-Rendille, although these locations are occasionally grazed by the Rendille (Kenya Population Census, 1979, Volume 1, p.71). The resultant figure of 14,259 sq. km can be regarded as a minimum because the Rendille frequently and particularly in drought periods move their livestock to areas outside Laisamis Division.

(3) The study area is 22,500 sq. km in size. The southern half is in Rendille country while the northern half is situated in the homelands of the Gabra.

(4) The Kargi wells and borehole provide only limited supplies of water. As a result the majority of animals in the area water at either the Korole springs or Bagazi wells. On the other hand the majority of cattle and small stock in the Korr area are watered at Korr trading centre.

(5) A number of authors refer to the adverse effect on range management policy and planning when issues are viewed mainly in physical terms to the exclusion of the concerns of the people who use the range. (Hjort 1982, Johnson 1980).

(6) While the Kenya government has assisted in establishing marketing facilities for agricultural products such as coffee and tea (export crops), and maize and beans (subsistence crops) it has yet to assist in creating adequate marketing facilities for livestock in spite of the finance invested in the Livestock Marketing Division (L.M.D.) which at present is not operating.

REFERENCES

- Anteneh, A. "Trends in sub-Saharan Africa's livestock industries". *ILCA Bulletin* No 18, April 1984.
- Barfield, T. *The Central Asian Arabs of Afghanistan: Pastoral Nomadism in Transition*. Austin: University of Texas Press, 1981.
- Barth, F. *Nomads of South Persia: The Basseri Tribe of the Khamseh Confederacy*. London: George Allen & Unwin, 1961.
- Dahl, G. *Suffering Grass: Subsistence and Society of Waso Borana*. Stockholm Studies in Social Anthropology, 1979.
- Field, C.R., Lamprey, H.F., Masheti, S.M. and Norton-Griffiths, M. "Household, Livestock and wildlife Numbers and Distribution in Marsabit District: Population Size, Densities and Habitat Selection of Fixed Environmental Variables" In *IPAL Technical Report* Number A-5 (ed.) Walter J. Lusigi, 1983.
- Hjort, A. A Critique of "Ecological Models of Pastoral Land Use". *Nomadic Peoples*, Number 10, April 1982.
- IPAL, *Resource Management Plans for the Rendille Area of Northern Kenya*, Vols. 1 & 2, 1982.
- Johnson, D. "UNCOD, Combating Desertification, and the Pastoral Nomad". *Nomadic Peoples*, Number 5, January 1980.
- Mukasa-Mugerwa, E. *The Camel (Camelus Dromedarius): Bibliographical Review*. Addis Ababa: ILCA, 1981.
- Njiru, G. "Trade among the Rendille of Laisamis Division, Marsabit District". In *IPAL Technical Report*, Number A-5, (ed.), Walter Lusigi, 1983.

Figure 1: Location of IPAL study area

Controlling sand dune encroachment in Iraq

Dr. Ferenc Gati¹

Research Institute for Soil Science and
Agricultural Chemistry of the
Hungarian Academy of Sciences,
Budapest.

As an expert invited by the State Organization for Land Reclamation (SOLR), the author spent six months in Iraq from October 1, 1981 to April 1, 1982. His experiences and comments concerning the desertification programme are summarized in the present paper.

Present practice of sand dune fixation

The lands endangered by sand dunes are to be found in the north of the country in the region of Baiji and southwards in the areas of Al Hillah, Al Fajer, As Samawah and An Nasiriyah. Near the town of Baiji is the Experimental Station for Soil Conservation and at Al Fajer the Masab Al-Aam Sand Dune Fixation Project is being carried out. The common characteristic of both regions is that more and more agricultural lands are endangered by shifting sands, thus sand dune fixation constitutes a primary task. The dunes of the Baiji region consist mainly of sandy soils, whereas in the Masab Al-Aam area usually sandy loams are to be found. Nevertheless, both projects face similar problems and the methods of protection are also similar.

Damage to soil caused by wind erosion endangers nearly the whole Mesopotamian Lowland (Fig. 1) but becomes most spectacular where the extension of sand dunes threatens roads, rivers and agricultural lands with burial.

Protection is afforded by several methods:

a) At the border of the desert 15-20 m high banks are built, usually in the form of squares 1 x 1 km in

size, and these as well as the dunes upward from them are mechanically fixed by mulching with bitumen emulsion.

- b) This prestabilization prepares the way for the planting of a system of shelter-belts with drought-resistant trees, such as *Acacia arabica*, *Acacia melanoxylon*, *Casuarina equisetifolia*, *Eucalyptus camaldulensis* (*E. rostrata*), *Parkinsonia aculeata*, *Tamarex articulata* (*T. aphylla*), etc.
- c) On the sand dunes themselves wind-barriers are also formed to stabilise the surface, by various means:
- Dune fixation by afforestation on a grid system.
 - Checkerboard planting with indigenous plants, e.g. "Turtija" (*Schanginia aegyptica*), "Tarhaf" (*Tamarisk* spp.), "Soos" (*Glycyrrhiza glabra*), "Shoqe" (*Prosopis stephianiana*), "Aagol" (*Alhagi maurorum*), etc.
 - Formation of sand mounds with sand-fixing plants, e.g. *Calligonum commosum*, *Syperus conglomeratus*, *Panicum turgidum*, *Phragmetis communis*, *Ricinus communis*, *Thypha angustata*, "Saxaul" (*Hyloxylon persicum*), etc.
- d) In the depression and inter-dune areas, establishment of trees, shrubs, sand fixing plants and low herbs and grasses, mainly *Aristida* sp. and *Cornulaca* sp.
- e) Levelling of sand dunes. This method has been applied with success at the Baiji Experimental Station. Around the flat sand land formed in this way, a protective forest belt was built. On the levelled area potatoes, onions and barley are cultivated by irrigation. The composition of the fertilizer used is: 4 m³ animal manure, 50 kg superphosphate, and 50 kg ammonium sulfate per *donna*

(2,500 m²). Annual precipitation is about 170 mm.

- f) Afforestation techniques are combined with subsurface irrigation at the Baiji Experimental Station. In the middle of a 2 x 2 m square mound a tree is planted in a 0.5 m high earthenware pot, perforated at its bottom. Every second or third day water is poured into the pot to provide moisture needed by the root zone of the tree. It should be mentioned that at present there are already more up-to-date techniques for subsurface irrigation, e.g. the Hungarian subsurface drip irrigation.

- g) Afforestation belts on the semi-fixed areas. Here the same tree varieties are planted on a larger area. During the first two to three years the new plantation is supplied with water regularly by ditch or drip irrigation.

Other important methods for fixing moving sand:

- Fixation of sand surfaces by mechanical mulching

Investigations and examinations were made with different sand-dune fixing materials to compare their binding effect.

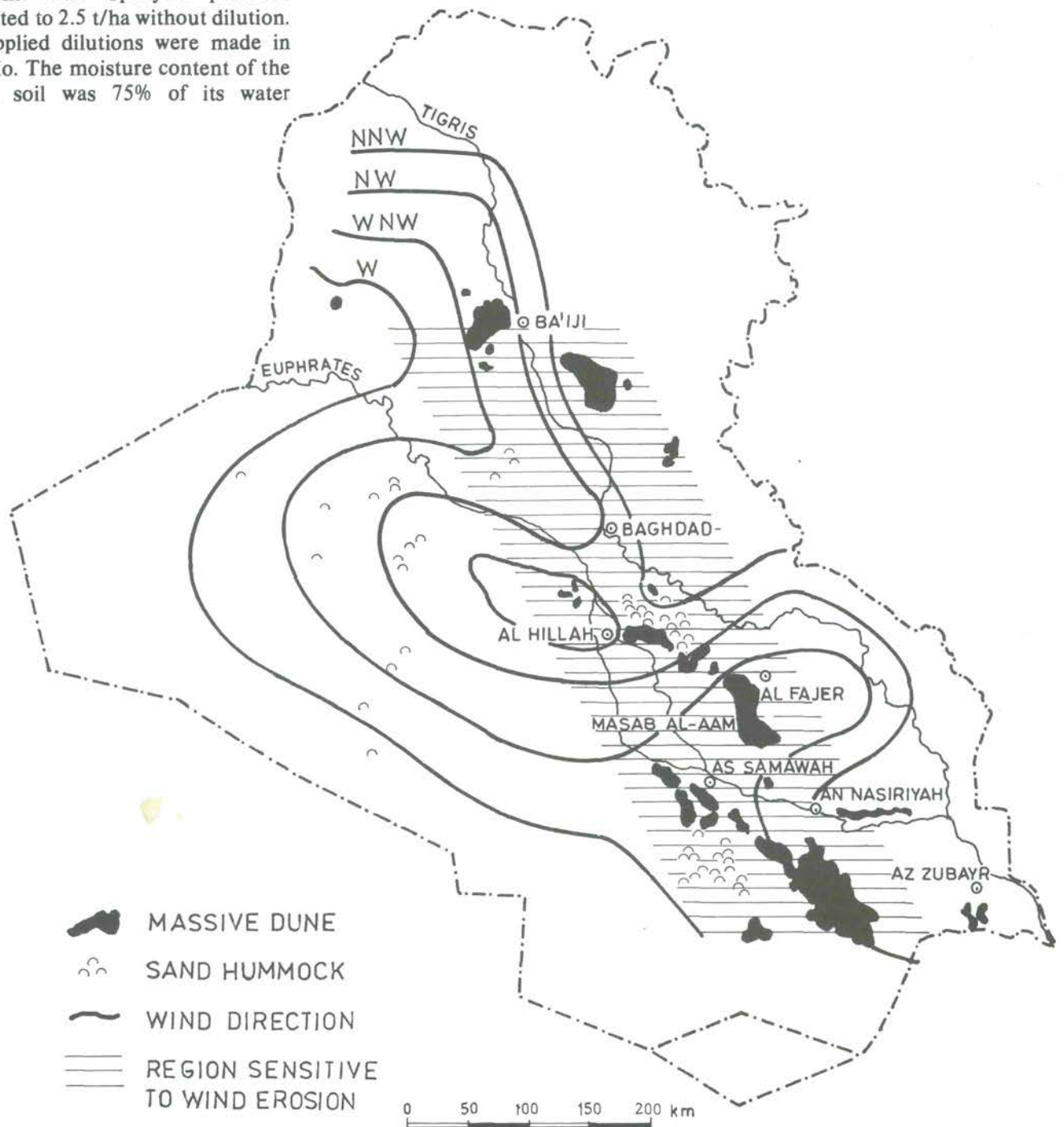
The applied fixing materials were as follows:

- Bitulax. Anion active bitumen emulsion (Hungarian product).
- Kollobit. Cation active bitumen emulsion (Hungarian product).
- Petrofina. Cation active bitumen emulsion (Belgian product).
- Extrasol. Latex emulsion (Hungarian product).
- Dune bond. Latex emulsion (British product).

6. Humacril. Humic acid-polymer compound (Hungarian product).
7. Lignite suspension. Disaggregated lignite in suspension form (Hungarian product).
8. Solfix-A. High molecular polymer (Hungarian product).
9. Solfix-B. High molecular polymer (Hungarian product).

The materials listed above were applied on dry and on moistened soil surfaces using dune sand from Masab Al-Aam. The sprayed product amounted to 2.5 t/ha without dilution. The applied dilutions were made in 1:1 ratio. The moisture content of the wetted soil was 75% of its water

Figure 1.
IRAQ
LOCATION OF SAND DUNES
and
WIND DIRECTION





Sand fixing shrubs and plants (Tamarisc, Panicum turgidum, Ricinus communis, Aristida sp. etc.) are established in the depressions and inter-dune areas of Masab Al-Aam. (F. Gati)

holding capacity. The observations made after 24 hours on the soil surface covered with the soil fixing materials are presented in table 1.

In their experiments, the bitumen and latex emulsions showed the best fixing effects.

2. *Mixing sand and clay to create cultivable lands in the sandy range lands*

One effective method for fixing shifting sand is to mix the sand with the clay soil of the threatened cultivable area in a wide strip on the range, and thus providing physical and chemical soil properties which are favourable for afforestation and crop production. This method can also be applied to save the soil behind high banks where drifting sand has already covered the fertile soil. Prefixing the surfaces in the area in front of the high

banks should naturally be carried out to prevent further drifting.

Experiments have been performed mixing the Masab Al-Aam dune sand and the clay of the threatened areas in different ratios. Tables 2 and 3 show the physical and chemical changes occurring in the different mixtures.

Mechanical analyses proved that a simple and adequate mixture of

Table 1

Physical properties of the fixing materials after covering the soil surface for 24 hours

Sample	Materials	Homogeneity		Flexibility		Stability	
		Dry	Wet	Dry	Wet	Dry	Wet
1.	Bitulax	Poor	Perfect	—	Good	—	Good
2.	Kollobit	"	"	—	"	—	"
3.	Petrofina	"	"	—	"	—	"
4.	Extrasol	Poor	Perfect	Good	Perfect	Good	Perfect
5.	Dune bond	"	"	"	"	"	"
6.	Humacril	"	"	"	"	"	"
7.	Lignite suspension	Poor	Poor	Poor	Poor	Poor	Poor
8.	Solfix-A	Perfect	Perfect	Fragile	Good	Good	Perfect
9.	Solfix-B	"	"	"	"	"	"

different ratios could change the texture of the mixed clay and sand towards a sandy clay, clay loam, and finally, at 1:3 sand-clay ratio, to a soil with typical clay characteristics.

The changes in the chemical composition of the sand-clay mixtures are also significant. On increasing the clay proportion in the mixture, the pH, electro-conductivity (ECe) and organic matter content became equalized, the lime content and cation exchange capacity (CEC) increased, and nutrient elements such as N, P and K were restored to an average value. It was found that even a 1:1 mixing ratio could ensure favourable changes in the physical and chemical composition of the mixed soil.

Table 2

Mechanical analysis of Masab Al-Aam sand and clay soils and their mixtures

Sample No	Soil	Sand	Silt %	Clay	Texture
1.	Dune sand	76	9	15	sL
2.	Clay (desert)	21	45	34	cl
3.	Sand-clay mixture 3:1	60	19	21	Scl
4.	Sand-clay mixture 2:1	56	23	21	Scl
5.	Sand-clay mixture 1:1	47	26	27	Scl
6.	Sand-clay mixture 1:2	37	36	27	clL
7.	Sand-clay mixture 1:3	32	36	32	cl

S = sand; L = loam; cl = clay

Table 3

Chemical analysis of Masab Al-Aam sand and clay soils and their mixtures

Sample No	Soil	pH pas	ECe mmhos Sat.ext	Organic matter %	Lime %	Gypsum %	C.E.C. meq	Exch. Na meq	Extr. K meq	No ₃ ppm	P ppm NaHCO ₃
1.	Sand	7.9	2.3	0.1	22.4	0.22	7.8	7.05	0.54	64.0	5.2
2.	Clay	8.0	1.8	0.3	29.6	0.30	16.5	4.85	0.94	32.0	2.5
Mixtures											
3.	3:1	8.0	2.2	0.2	24.5	0.29	9.8	6.63	0.62	56.0	5.0
4.	2:1	8.0	2.3	0.1	25.2	0.22	9.5	6.90	0.69	36.0	3.0
5.	1:1	8.0	2.0	0.2	25.7	0.29	11.0	6.09	0.69	32.0	4.2
6.	1:2	8.0	1.9	0.2	27.2	0.23	12.9	5.66	0.82	40.0	4.2
7.	1:3	8.0	2.0	0.2	28.4	0.21	14.6	5.48	0.84	32.0	2.5

Controlling sand dune encroachment in Iraq

On a larger scale sand dunes can be shifted onto the clay soil, the surface levelled and then the two soil layers homogenized by the Deutz Deep-Spading Technique. This is followed eventually by an addition of ameliorating substances if improvement of the soil is necessary. After fertilizing the soil becomes suitable for cultivation or afforestation. It is advisable to grow nitrogen-binding leguminous crops on the uncultivated soil and to plough the resulting green manure into the soil for one or two years. Irrigation of the area is carried out by the usual drip, sprinkler, etc. techniques.

3. *Afforestation with hydroboring technique*

Unfortunately, little attention has been given to afforesting the studied areas, or those threatened by sand dunes generally although, in my opinion, the possibility exists.

According to the project plan a forest plantation could serve as a covering for the soil surface and the shrubs and trees as shelter-belts for hindering wind erosion, etc. The full mechanization of afforestation with simultaneous application of special

organic and slow acting fertilizers and suspensions has been developed and used successfully in Hungary. The hydroboring technique for tree and shrub planting could be very effective not only in Iraq but in other arid countries as well.

In the project areas, remarkable afforestation experiments are going on. On the basis of the results obtained, large-scale afforestation could be carried out by using suitable technology and tree varieties in the areas threatened by sand dunes and on other territories, for example in the lowlands of Iraq.



New tamarisc plantations under drip irrigation. (F. Gati)

News from UNEP

**UNEP Governing Council,
Twelfth Session, 16-29 May
1984**

UNEP's twelfth Governing Council was a particularly important one for the Desertification Branch. Two days were devoted to discussion of the Executive Director's report on the General Assessment of Progress in the implementation of the Plan of Action to Combat Desertification, 1978-1984 (see the supplement to *Desertification Control* No. 10 for a detailed discussion).

Represented were 53 member states of the Governing Council, 35 non-member states, 15 United Nations bodies and Secretariat units, 6 UN specialised agencies plus the IAEA, 11 intergovernmental organizations, 44 non-governmental organizations and 4 observer organizations. The proceedings were held in the impressive new UN Office complex in Gigiri and many representatives commended the UNEP Secretariat on the smooth running of this year's Governing Council.

Introducing the Executive Director's report on the General Assessment (UNEP/GC.12/9) to the plenary session, Dr. Tolba said that despite data which were not entirely adequate in a number of regions, the assessment nevertheless clearly showed that the war against desertification was not being won. Accordingly, the goal of stopping desertification by the year 2000 must be regarded as unrealistic. In the seven years since UNCOD, the world had learned that desertification had a wide variety of harmful consequences and, alarmingly, that it fed on itself. Estimates of the cost of not stopping desertification over a 20-year period were of the order of \$520 billion. No price



Dr. Mostafa Tolba addressing the twelfth Governing Council.

tag could, of course, be put on the sufferings of the 850 million people now living in areas that are affected. These people, bewildered and angry Dr. Tolba said, were now looking to their Governments, the United Nations and other organizations for solutions.

There was no uncertainty surrounding the causes of desertification. Overgrazing, deforestation, bad cultivation practices and poor irrigation resulted in destruction of the resource base of nations, and the causes of this were many and complex. Although the problem was on a dauntingly large scale, the solution had to encompass individuals and communities.

A major constraint identified by the assessment was the low priority developing countries gave to fighting desertification. A new willingness to help the rural poor in those countries would undoubtedly encourage development assistance agencies to change their priorities too. Another major constraint was lack of resources. Overcoming that constraint depended on a new preparedness by Governments to change their

time horizons for planning. There was an urgent need for Governments to draw up national plans of action, as recommended by UNCOD, and to set up national co-ordination machinery. Very few had done so to date.

Among the recommendations and priority areas for action set out in his report, he attached particular importance to improvement in land-use planning in the drylands, priority attention to land of highly productive potential considered to be at greatest risk; concentration of improved water management, greater emphasis on training and applied studies to improve national anti-desertification capabilities, focus on the level of small community projects and programmes overcoming the political constraints to improved regional co-operation; and the launching of a meaningful effort at the international level.

Following the Executive Director's opening statement, a multi-projector slide show, prepared as part of the desertification information campaign, was presented, followed by a slide exhibition

on the methodology used to prepare the desertification data base and maps.

Delegations unanimously supported the Executive Director's report on the general assessment, which many participants described as comprehensive. The assessment correctly highlighted the importance of desertification as a global problem. The Council endorsed the finding that the assessment had reaffirmed the validity of the principles of the Plan of Action as a valuable instrument for combating desertification, and many representatives pledged their continued support and co-operation in the implementation of the Plan.

The Tenth Meeting of the Inter-Agency Working Group on Desertification, 14-16 March 1984

The tenth meeting of the IAWGD was held from 14-16 March 1984 in the Palais des Nations in Geneva. The meeting was attended by the representatives of the following agencies and organs of the United Nations system: ECA, ECWA, FAO, ILO, UNEP, UNESCO, UNFPA,

UNIDO, UNSO/UNDP, WFP and WMO.

The first matter to be discussed was the implementation of General Assembly resolution 35/73, para. 10, which calls upon UNEP to institute in co-operation with the entire UN system specific programmes of research and training at the national, regional and international levels. A meeting was held in Aleppo 27 February - 1 March 1984 to discuss the establishment of a programme of research and training in the ECWA region. This will be implemented in 1985 as a new UNEP project.

Preparation of the teaching and management manuals as called for in the PACD were next discussed. A general feeling was that a manual was very much needed for decision makers in countries affected by desertification on an economic analysis of anti-desertification projects. It was agreed that an outline of such a manual would be prepared for comments by agencies and that a list of potential authors to choose from be drawn up. After reception of comments preparations would begin to write the manual. A manual on arid lands forestry was currently under preparation by FAO with UNEP financing. The meeting confirmed the need for the translation of the manuals into the official United Nations languages. In this connection the UNIDO and ILO representatives suggested that while considering modalities of the preparation and translation of the whole series of manuals, the possibility of identifying countries who may wish to undertake the translation work for the benefit of other countries of a region should be given consideration.

A summary of the draft Executive Director's report on the general assessment of progress in the implementation of the PACD was then presented, which was followed by a lively discussion. The meeting

agreed that the data base on desertification is still inadequate and that cautious use therefore should be made of aggregate data and statistics in the report. The ILO representative stated that an effort should be made to evaluate the socio-economic cost of desertification.

Ten members presented reports on their organization's activities in the field of desertification. It was suggested that in future reports should include information on training in view of its importance in the agencies' activities and to the countries affected.

The Secretariat circulated for discussion a working paper on co-ordination of international activities in the preparation of the national plans of action to combat desertification (NPACD) and national conservation strategies (NCS). The meeting felt that NPACDs and NCSs have very similar objectives and efforts should be made to co-ordinate the two exercises and to avoid duplication as far as possible. One or more countries, namely Pakistan, Senegal, Tanzania and Zambia may be considered for a trial on how such a joint effort for the preparation of NPACDs and NCSs could be co-ordinated or even combined.

The Eleventh Meeting of the IAWGD, 10-11 September 1984

The eleventh meeting of the IAWGD was held on 10-11 September 1984 at the ILO headquarters in Geneva. The meeting was attended by representatives of the following agencies and organs of the United Nations system: ECA, ECWA, FAO, ILO, UNCTAD, UN/DTCD, UNHCR, UNEP, UNESCO, UNFPA, UNIDO, UNSO, WMO and the World Bank.

The first substantive item discussed was the progress in preparation of the teaching and management manuals. FAO informed the meeting of their activities relevant to this matter and of the

commencement of a manual on the economics of watershed management in co-operation with the East-West Centre. It also advised the meeting on the receipt from the consultant of a finished manuscript of the manual on arid lands forestry, which was now under review at FAO. ECWA informed the meeting about the latest developments regarding the preparation of a manual on economic analysis of anti-desertification projects, including the identification of consultants for writing of the manual. The cost of the manual was estimated at \$75,000. Since a similar activity is underway in another section of UNEP it was decided to postpone a decision on how to proceed until discussions were held at UNEP to prevent a duplication of effort.

Eleven members then presented reports on their organization's anti-desertification efforts.

Decision 12/10 of the UNEP Governing Council requested *inter alia* that a review of the functions and outputs of the IAWGD be made. A working paper on this item was circulated by the Secretariat for discussion. During the discussion the Group reaffirmed the relevance of its terms of reference which required no addition or alteration. It noted that of the six functions approved for it by the ACC, four either dealt directly with or were related to co-operative and co-ordinated programming and implementation of their anti-desertification actions. The Group reviewed its outputs during the six years of its existence and recognized that a number of constraints had impeded a satisfactory realization of its aims. They were:

- limited resources, both human and financial for desertification related activities in most of the participating agencies;
- a comparatively restricted recognition by some members of the UN

system of their role in implementing the PACD;

- shortage of time available during the meetings of the Group for actual substantive discussions;
- lack of continuity in representation of agencies in the meetings of the Group which sometimes impeded implementation and effective follow-up of the IAWGD recommendations;
- inadequate articulation of the agencies mid-term planning of programmes and budgets as they relate to desertification.

The members then discussed ways of improving the functioning of the Group and agreed that the working paper prepared by the Secretariat on this subject appeared to be satisfactory for submission by the Executive Director to the 13th session of the UNEP Governing Council in response to para. 25 of decision 12/10.

The next item to be considered was a draft of the programme of the Desertification Branch for 1986-1987, including the budgetary implications for concerned UN agencies. Three working papers prepared by the Secretariat were circulated for discussion:

- (a) Training for desertification: a discussion paper;
- (b) A note on regional networks required by decision 12/10; and
- (c) The 1986-1987 biennium programme budget.

The discussion paper on training focused on implementation of the recommendations for action in the Executive Director's report on the general assessment for training and retraining of 600 participants within the next three years. It was agreed that UN agencies should provide the Secretariat (Desertification Branch) by the end of October 1984 with the detailed information on their ongoing training courses. The Secretariat will prepare, on the basis of the information

received, a consolidated paper for consideration at an *ad hoc* IAWGD meeting devoted to this subject. The meeting will be held in early 1985.

The note on regional networks prepared by the Secretariat proposed a schedule for implementation, modality for operation, and a timetable for action required by the Group. Members of the Group were requested to provide relevant information concerning the status of regional networks in Africa, Latin America and South Asia to the Secretariat before the end of November 1984. FAO offered to undertake organization of networks on sand dune stabilization and afforestation with some financial support from UNEP. A meeting was provisionally scheduled for early 1985 to outline a plan for implementation of the networks.

During discussion of the draft 1986-1987 UNEP anti-desertification programme members expressed their interest in being associated with several activities mentioned in the document. The Secretariat requested members comments on the document before mid-October so that they might be incorporated before the finalization date of end-October.

It was proposed that the next IAWGD meeting be held in Geneva in July 1985.

Preparations for DESCON-5

Twenty-six project proposals have been received from Governments for consideration at the fifth meeting of the Consultative Group for Desertification Control (DESCON). They have been sent out to potential donor Governments and international organizations for review. Responses to the Secretariat have so far been few. If donors express interest in developing one or more of the project proposals further, joint missions will be organized where UNEP and donor representatives will visit the recipient country to

GRIN AND BEAR IT

BY LICHTY



"Eventually we will run out of food to feed ourselves, fuel to warm ourselves, and air to breathe . . . This is something we must learn to live with!"

formulate a more detailed project proposal. The final version of project documents is scheduled for completion by March 1985, when they will be sent to DESCON members along with other documentation related to the meeting. The DESCON-5 meeting is scheduled to be held in Geneva 16-22 July 1985.

Workshop to Develop Regional Programmes and a Network of National Institutions for Research and Training in Desertification Control, Aleppo, Syrian Arab Republic, 27 February-1 March 1984

The meeting was organized by UNEP as another step in its efforts to implement the provision of General Assembly resolution 35/73 calling on UNEP to institute, in co-operation with other United Nations organizations and bodies, research and training programmes on desertification control at the national, regional and international levels. It was attended by representatives of the Arab Centre for the Studies of Arid Zones and Dry Lands (ACSAD), the Economic Commission for Western Asia (ECWA), the International Centre for Agricultural Research in the Dry Areas (ICARDA) and the Regional Office for Western Asia of UNEP, along with leading scientists of the region.

The meeting developed a draft programme document on research, training and communication for desertification control in the ECWA region. The document identifies the objectives of the regional programme, elaborates on research, training and communication components of the programme and gives examples of project ideas and proposals for research and training components of the programme. It also presents an institutional set-up for the effective implementation of the programme and budget estimates for the first five years. UNEP's planned contribution to this endeavour is \$50,000 a year.

Desertification Control Training Seminar in China, 10-30 June 1984

The third UNEP sponsored international Desertification Control Training Seminar in China was held at the Institute of the Desert, Lanzhou, from 10 to 30 June 1984. Seventeen participants from eight developing countries took part.

The seminar was carried out in three stages. The first stage involved a series of lectures by Chinese academics on various aspects of arid land studies, followed by two films on desertification control in China. The second part of the training programme concerned field trips and took the trainees to many different parts of China to observe a variety of desertification control techniques. The dry steppes of Inner Mongolia were visited to study the interrelationships of pasture and cropland utilization, the fixation of coastal sand dunes was observed in southwest Guangdong and water erosion control in the high rainfall granite highlands of Dian Ba. Field protection belts in Qinghai were visited and the control of shifting sands along the railway line between Zhong Wei and Bo Ton in Ningxia was studied. The trainees also studied remote sensing, the analysis of sandy materials and the use of a wind tunnel in simulating aeolian action in the laboratories of the Institute of the Desert.

The third stage involved academic exchanges between the trainees and staff of the Institute of the Desert of the Chinese Academy of Sciences in Lanzhou. The trainees summarized their experiences and impressions of the training seminar and presented a summary of the main desertification problems in their respective countries. It was estimated that approximately 10,000 km were travelled in the course of the programme.

Follow-up activity to the training seminar will involve visits by staff of the Institute

of the Desert to three of the countries represented at the training seminar. Visits are currently planned for Argentina, Morocco and Sudan, and to UNEP headquarters, to discuss further development of the follow-up activities.

International Workshop on Desertification and an Integrated Approach for its Solution, USSR, 9-23 October 1984

A workshop was held from 9 to 10 October in Moscow and 11-23 October 1984 in Tashkent, USSR, as part of a UNEP/UNEP/COM project "Assistance and Training for Combating Desertification through Integrated Development (Phase I)". The workshop was attended by 17 participants from developing countries in Africa, Western Asia, India and Latin America.

As part of the same project a team of specialists from the USSR visited Peru from the end of October 1984 for 30 days to assist the Government in the elaboration of regional integrated development schemes.

Ministerial Conference on a Concerted Policy for the Control of Desertification and Environmental Protection in CILSS, ECOWAS, Maghreb Countries, in Egypt and Sudan, Dakar, Senegal, 18-27 July 1984

High level representatives from countries in the Sudano-Sahelian region, West Africa and North Africa, from several United Nations agencies and bodies, observer countries, and international co-operation and donor organizations met in Dakar 10-27 July 1984 to discuss ways and means of co-ordinating international action and formulation of a concerted policy to combat desertification. UNEP, which provided financial support to the conference, was represented by its Deputy Executive Director, Mr. Joseph Wheeler, who addressed the conference in

the name of Dr. Mostafa Tolba. Mr. Wheeler reconfirmed UNEP's commitment to the fight against desertification and pledged UNEP's continued support to affected countries.

The principal results of the conference were:

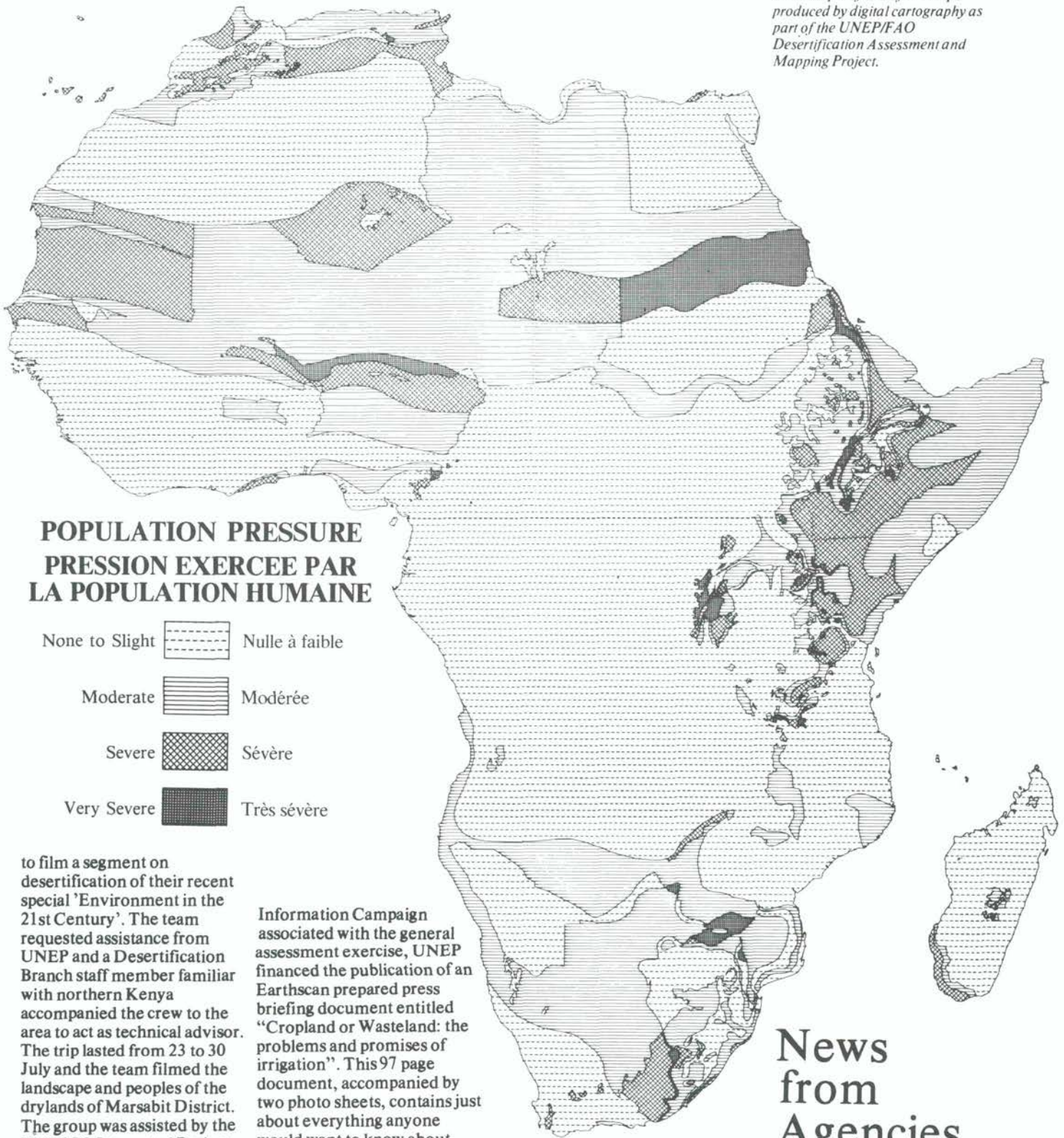
- a clear expression of the political will of affected countries in northern and western Africa to co-operate in the combat against desertification;
- a call for the preparation of a regional programme to combat desertification in which national plans of action would be co-ordinated and common actions formulated and implemented. Priority would be given to a multidisciplinary and integrated approach;
- an agreement that the regional priority objectives will involve four main resources: water, soils, plant cover and energy;
- a proposal that the Conference of Ministers will be held periodically to evaluate and follow-up the joint strategy and the joint co-operative actions, and to propose any form of organization capable of improving co-ordination and co-operation.

The conference came to no agreement on the creation of a new institution to co-ordinate action. Existing institutions such as CILSS and ECOWAS will continue to work at the sub-regional level and be strengthened. Major international organizations were called upon to give greater priority to combating desertification through concrete projects and UNEP in particular was called upon to reinforce its department for desertification control by giving to it additional material, financial and human resources.

Environment in the 21st Century

The national public television corporation of Japan, NHK, came to Kenya in July of 1984

An example of one of the maps produced by digital cartography as part of the UNEP/FAO Desertification Assessment and Mapping Project.



**POPULATION PRESSURE
PRESSION EXERCEE PAR
LA POPULATION HUMAINE**

None to Slight		Nulle à faible
Moderate		Modérée
Severe		Sévère
Very Severe		Très sévère

to film a segment on desertification of their recent special 'Environment in the 21st Century'. The team requested assistance from UNEP and a Desertification Branch staff member familiar with northern Kenya accompanied the crew to the area to act as technical advisor. The trip lasted from 23 to 30 July and the team filmed the landscape and peoples of the drylands of Marsabit District. The group was assisted by the UNESCO Integrated Project in Arid Lands who are conducting research in the area. The film was scheduled to be broadcast on 4 November 1984 in Japan.

Earthscan Press Briefing Document on Irrigation

As part of the Desertification

Information Campaign associated with the general assessment exercise, UNEP financed the publication of an Earthscan prepared press briefing document entitled "Cropland or Wasteland: the problems and promises of irrigation". This 97 page document, accompanied by two photo sheets, contains just about everything anyone would want to know about irrigation and its relationship to desertification. Although irrigated land amounts to only 15% of the world's cultivated land it produces more than 40% of its crops. In terms of area land salinized or waterlogged by bad irrigation

might be relatively small, but when translated into food production the loss becomes great, hence the need to stress good irrigation practices.

News from Agencies

FAO

During the first phase of the UNEP/FAO Desertification Assessment and Mapping Project the report "Provisional Methodology for Assessment and Mapping of

Desertification" was published as a joint FAO/UNEP paper. The English version was printed in 3000 copies and distributed during the Twelfth Session of UNEP's Governing Council in Nairobi (16 to 29 May, 1984) to Governments and to relevant national, regional and international institutions. The French and Spanish versions will be ready in the second half of the year. The second phase of the Project started in July 1983. Its purpose is the preparation and publication of a Desertification Map of the World. Work has resulted in the compilation of the following maps:

- a) Desertification Hazards—Africa. Scale 1:5 million. Two map sheets and one legend sheet.
- b) Soil Elements Used in Assessing Desertification—World. Scale 1:10 million. Five map sheets (North America, South America, Europe/Asia, Africa and SE Asia/Australia), and one legend sheet. These maps are derived from the FAO/UNESCO Soil Map of the World, scale 1:5 million.
- c) Desertification Hazards—Africa, Component Analysis—Scale 1:25 million. One sheet containing the following maps: Soil Constraint, Water Action, Wind Action, Salinization, Animal Pressure and Population Pressure.

A single copy of the first two items was produced and presented to the Twelfth Session of the UNEP Governing Council in May 1984, Nairobi, Kenya. The third item was produced in 1000 copies (together with the booklet describing the methods used and the results obtained) and distributed to the participants at the Twelfth Session of UNEP's Governing Council.

Further technical information concerning the methodology

used for compilation of the maps can be obtained from the Soil Resources, Management and Conservation Service, Land and Water Development Division, FAO, Rome.

FAO Activities in other areas include:

(a) *Forestry*

Medium-term objectives in this area include the promotion of forest conservation activities and the closer integration of forestry in land-use programmes to ensure due attention to desertification control and the rehabilitation of marginal lands.

Activities in the forestry sector will make an even more important contribution to agricultural production in arid and semi-arid areas by ensuring a regular flow of water from catchment areas to rivers and reservoirs for irrigation and by providing protection in many ways; from fixing moving sand dunes to sheltering crop land against wind and checking soil erosion.

Emphasis is being given to arid zone forestry in order to contribute to environmental stability and welfare of populations in areas critically affected by desertification. An inter-disciplinary expert consultation on the role of forestry in combatting desertification will be convened and follow-up ensured through state-of-the-art reports and demonstration activities. A workshop on land rehabilitation of arid Mediterranean areas will be held in connection with the Fourteenth Session of the European Forestry Commission Working Party on the Management of Mountain Watersheds.

Efforts will be made to promote rural development, land-use improvement and land rehabilitation in upland watershed and arid zone forestry areas. FAO's advisory assistance and operational activities will give particular

emphasis to arid zone forestry in order to contribute to environmental stability and the welfare of populations in areas critically affected by desertification.

(b) *Soils*

An awareness campaign on soil conservation policies, initiated through the provision of documents (e.g. World Soil Charter) and filmstrips will be continued through the preparation and distribution to Member Governments of a special "information pack". Technical advice will be provided to governments in the formulation and implementation of soil conservation programmes and exchange of information on successful practices in soil conservation will be promoted. Publications on soil conservation in the humid tropics, and soil and water conservation techniques in semi-arid areas will be produced.

Adequate attention will be given to the protection of natural resources, particularly safeguarding of soil and water resources against degradation.

Action programmes, especially in soil conservation, will be continued at country level in order to introduce appropriate control measures to counteract the deterioration of the production base.

A desertification map of Africa has been prepared and displayed at UNEP's Twelfth Governing Council, using the methodology developed in the FAO/UNEP project on Desertification Assessment and Mapping.

(c) *Rangeland Management*

Under the FAO/UNEP EMASAR Programme (Ecological Management of Arid and Semi-arid Rangelands), assistance will continue in response to requests from Member Governments on the

development of more rational integrated systems of utilization of arid and semi-arid grazing land resources, which presently provide about 80-90% of the feed resources for livestock populations in arid zones. Priority will be given to developing and increasing the availability of arid zone fodder shrubs and trees that can provide valuable supplementary fodder during feed-deficit periods and also prevent further land degradation on barren lands.

Within the framework of the UN System-Wide Medium-Term Environment Programme (SWMTEP), FAO is cooperating with UNEP in carrying out a pilot project on Inventory and Monitoring of Sahelian Pastoral Ecosystems.

Some Activities of FAO Related to the Problems of Drought in Africa.

FAO's role includes providing advice and assistance on request to the member countries in Africa. The 24 countries now facing drought problems are receiving special attention. For example, between 1980 and early 1983, FAO's programme development mission to African countries identified more than 800 technical assistance projects with a total value of some US\$1,000 million.

Among these, about 170 projects totalling US\$200 million are directly related to food production and food security in general, in the food-deficit countries.

These activities include improvements in rainfed agriculture, soil conservation and combatting desertification, integration of livestock with crop production, improving forestry development, strengthening science and technology and involving people in development programmes of land reform.

Drought assistance is channelled through FAO's Office for Special Relief



These technicians are conducting a study of soils in the Rajasthan Canal area of India to prepare maps of soil potential to best make use of irrigation waters. (FAO/T. Drieberg)

Operations (OSRO) — set up as the Office for Sahelian Relief Operations during 1973 to respond to a severe drought.

The success of the operations prompted FAO to expand OSRO's operations to deal with crises worldwide. Africa has continued to be a priority, accounting for US\$126 million — well over half the Office's expenditure since 1973.

In Africa, between 1978 and 1982, 99 projects by OSRO have contributed to the recovery of hundreds of thousands of hectares of food

crop and livestock land. In 1983, 38 projects with a total budget of US\$21.5 million were underway in Africa.

Early Warning Systems and Food and Feed Security

The FAO Global Information and Early Warning System is playing an important role in crop forecasting and assessment of food supplies. The agro-meteorological and crop monitoring undertaken in the Sahel since 1977 has made it possible to assess two to three months before harvest the likely shortfall in

production and to alert the international community in time for remedial action to be taken.

A regional crop forecasting and early warning project for countries belonging to the Southern African Development Co-ordinating Conference (SADCC) is expected to begin operations in 1984. This project, prepared by FAO, would establish a regional early warning system based on national systems and aims at providing timely key information to supply foodstuffs.

FAO has formed a special relationship with the Permanent Inter-State Committee to Combat Drought in the Sahel (CILSS) because of the region's chronic food shortage. The drought of 1968-73 prompted Burkina Faso, Chad, Mali, Mauritania, the Niger, the Gambia, Senegal and Cape Verde to join forces for improved food security and production. FAO provides material and technical assistance and training. FAO has also helped to strengthen the Sahel's meteorological services to lessen the impact of future drought.

FAO has planned two workshops on national preparedness to meet acute and large-scale food shortages in Africa — one for Eastern and Southern African countries to be held in October 1984 at ECA premises in Addis Ababa, Ethiopia, and soon after another for Western African countries to be held in Dakar, Senegal. The workshops are intended to enable countries to share national experiences in coping with acute and large-scale food shortages. Three basic aspects of preparedness will be discussed: (i) guidelines for preparation of a manual of food relief activities and procedures to enter into force in the event of acute and large-scale food shortages, (ii) identification of objective indicators to signal acute and large-scale food shortages at national level, and (iii) organizational aspects of preparedness in establishing and strengthening early warning systems and special units to deal with food emergencies.

As a result of past droughts, a large number of animals have died and the productivity of the surviving ones is poor, because of inadequate feed and fodder supplies and veterinary services. Therefore FAO is assisting in the development of feed security systems, as well as general animal health facilities, such as laboratory and veterinary services and provision of vaccines.

Forestry Development

Forestry is a major land use of areas prone to drought and has an important contribution to make to relieve the effects of drought. The FAO's Special Action Forestry and Rural Energy Programme was started in 1983 to mobilize resources for large-scale forestry projects in drylands with major fuelwood strategies. Projects are underway in Senegal, Kenya and Sudan and others are planned for Mali, Togo and Ghana. They aim to deal directly with urgent fuelwood problems while providing rural development.

During 1984-85 FAO will also give particular attention to Forestry problems associated with arid lands in Africa. Regular programme and field activities, which will contribute to alleviating the effects of drought include soil conservation, windbreaks and shelter belts, and wildlife management. An interdisciplinary expert consultation on the role of forestry in combatting desertification will be convened with follow-up through demonstration activities.

Grazing Lands and Livestock Production

Recognizing the key role of livestock production in arid and semi-arid areas affected by drought, FAO gives considerable emphasis in its programme and field projects to the management of grazing lands, particularly in Africa. Amongst the activities conducted in African countries in the area are pre-investment surveys, grassland resources monitoring, advisory services and identification and formulation of programmes and projects to improve rangelands.

FAO field projects also stress the involvement of pastoralists and farmers in growing crops for providing additional livestock feed for implementing improved grazing management in the vicinity of villages.

Fisheries

Because of the food shortages as a result of the droughts, there is significant need and potential to exploit fisheries resources. To increase and maintain sustainable fish yields FAO provides assistance in evaluation, stock management and reduction in post-harvest losses, and improving market facilities. Assistance is provided to governments in accelerating their aquaculture development and implementation through regular programme and field projects in this area. In the fisheries sector, training, both formal and through strengthening of extension services, is an important part of FAO's action.

Post-harvest Losses

It is estimated that 20 to 40 percent of the total cereal produced in Africa is wasted after harvest. Reduction in food losses in storage, transport and marketing is, therefore, particularly important in the drought prone countries and FAO is providing assistance to countries on post-harvest technology for food grains and other agricultural products. Activities include planning and design of improved farm and storage structures and the improvement of processing facilities, rodent pest control and training in post-harvest loss reduction.

Land-use Planning

In addition to the measures designed to improve the use and productivity of drought affected lands, FAO's activities include assessment of long-term productivity potentials of such lands. It is recognized that the ability of land to produce is limited and that limits to production are set by soil and climatic conditions as well as the use and management practices applied to the land. Any attempt to produce in excess of these limits results in a vicious circle of degradation and ever decreasing yields. FAO is undertaking studies to determine these production

limits and delineate areas where land resources are insufficient to provide for the food needs of present and/or projected populations, and where action is urgently required to remedy this situation. Additionally, areas of particularly high degradation risks are being delineated. Such studies quantify the physical resource base and its potential to produce a vital element in the all important requirement for sound land-use planning.

UNESCO

The 22nd session of Unesco's General Conference reiterated its full support to the Unesco programmes concerned with arid and semi-arid lands. The part of the MAB Programme dealing with arid and semi-arid lands was singled out by the Conference in the form of a sub-programme entitled "Integrated Management and rural development of arid and semi-arid zones". This sub-programme includes in particular the continuation of the "Major Project on Research, Training and Demonstration applied to the Integrated Management of Arid and Semi-arid Regions". Similarly, the Conference decided on the continuation of the major regional projects on the rational use and conservation of water resources in rural areas, and other activities of the International Hydrological Programme related to arid and semi-arid lands. Furthermore, Unesco programmes concerned with natural hazards were extended by the General Conference to include the assessment of drought hazards and their prediction.

Programme on Man and the Biosphere (MAB)

International Meetings

The following two major international meetings were held recently:

- International orientation seminar on the Integrated Project in Arid Lands

(IPAL) Kenya, Marsabit District, Kenya, 31 October to 12 November 1983, attended by about 20 English-speaking specialists from countries in Eastern Africa, Arab States and West Asia;

- Seminar on the problems of wind erosion in pre-desert zones, Djerba, Tunisia, 21-26 November 1983, attended by about 60 specialists from countries in Europe, Africa, Arab States, as well as Australia and the United States, organized in the framework of the project IPAL Tunisia (UNEP/Unesco supported).

The following two meetings are mentioned as examples of major meetings also supported by the MAB Programme:

- The symposium on MAB pilot projects in arid lands convened within the Second International Rangeland Congress, Adelaide, Australia, 13-18 May 1984;
- The international round table on *Prosopis* in Africa, Chile, 11-15 June 1984, organized jointly by the Tarapaca University and the National Forestry Corporation of Chile, under the auspices of FAO and Unesco-MAB.

Training activities

The most important training activity which is related to desertification control is the training programme for integrated pastoral management in the Sahelian region. The annual 9-month post-graduate course being attended by about 15 specialists from various disciplines and sectors is being continued. In addition, annual training courses for technicians started in early 1984. This is a co-operative project by UNDP, UNSO, the Institut du Sahel and Unesco

with some technical support by FAO, and is based in Dakar, Senegal.

Planning of a similar training project for the southern African countries has started. A joint UNEP-Unesco project formulation mission was sent to SADCC countries in March 1984. The mission included a visit to Botswana, which has offered to provide the host facilities for this training programme.

Institution building

The governments of Kenya and the Federal Republic of Germany, and Unesco-MAB have agreed to establish a Kenya Arid Lands Research Station (KALRS), in Marsabit, northern Kenya. This project represents a follow-up to the Integrated Project in Arid Lands (IPAL) Kenya. Its aim is to provide continuity to research efforts concerned with the integrated management of grazing lands in the arid regions of Kenya.

The government of Syria has sought Unesco's co-operation for establishing a national institute on rangelands studies. A project identification mission was carried out, and efforts are being made to identify potential sources of funds.

National strategies to combat desertification

Unesco-MAB has continued to be involved in the efforts of certain countries and UNSO to prepare national strategies to combat desertification. A recent example of this is Niger. In order to prepare the data base, Unesco helped to update the 1977 Case Study on Desertification in Niger. A national seminar was organized to prepare the major elements of this national strategy.

Publications

— A number of IPAL Kenya technical notes have been published during the last six months. The full list of IPAL technical notes now amounts to about 15 issues.

- An issue has been prepared on man in arid lands in the MAB audio-visual series. This issue is based on the IPAL Kenya case study.
- Efforts are being made to translate and publish the 3 case studies on desertification which have been updated within the exercise to assess the implementation of the Plan of Action to Combat Desertification. The three updated case studies are: Niger, Tunisia and Chile.
- The May 1984 issue of the Unesco journal *Nature and Resources* dealt specifically with the problem of desertification. This number was made available for the special session on desertification of the UNEP Governing Council (May 1984).

International Hydrological Programme (IHP)

The International Co-ordinating Council of IHP met from 22 to 30 March 1984. It provided guidance for the new six-year programme (1984-1989), which includes specific activities concerned with the hydrology and water resources assessment in drought-prone areas.

Two new IHP publications need to be mentioned—a joint publication with WMO on "Guidelines for evaluation of national water resources assessment", and another joint publication with WMO now in press entitled "Hydrological aspects of droughts".

WMO

Expert Meeting on Special Environmental Report on the Use of Climatological and Meteorological Data in the Combat against Desertification

One of the activities planned in the WMO Plan of Action in the meteorological and hydrological aspects of the combat against desertification was the preparation of a Special Environment Report on the use of climatological and meteorological data and

information in the combat against desertification. Accordingly, in October 1983, an expert group meeting was convened to finalize the various draft chapters of the Special Environment Report. The draft report is being edited for publication. The report will be distributed to Members of WMO, especially those in desert-prone areas, to provide guidance on the application of climatological data and information to anti-desertification activities.

Expert Meeting on the Climatic Situation and Drought in Africa

The ECA Conference of Ministers in its Resolution 14(iv) urgently requested the Executive Secretary of the Commission to organize a special Scientific Round Table on the Climatic Situation and Drought in Africa, to which all member states of the Commission would be invited. In the early 1970's, drought was confined to relatively few countries in the Sudano-Sahelian zone of Africa. In contrast, 34 African countries are now being affected by drought; of these, 24 are among the least-developed countries (LDC's). The ECA Conference of Ministers appealed to WMO and other organizations, among them those represented on the Interagency Working Group on Desertification, to collaborate actively with ECA in this urgent task.

As a first step in the implementation of this resolution, WMO convened an Expert Meeting in October 1983 in Geneva to prepare an updated statement on drought. This statement was discussed by a multi-disciplinary meeting on impacts of drought held in UNEP Headquarters, Nairobi, in December 1983. These meetings prepared overview papers on different aspects of the African drought problem and its socio-economic impact which were later submitted to the Scientific Round Table on the Climatic Situation and Drought in Africa in Addis

Ababa, in February 1984. The report of the Scientific Round Table was submitted to the ECA Conference of Ministers in April 1984, in which the Secretary-General of the WMO participated.

Medium-term Mission on Drought Analysis

In response to a request from the Permanent Representative of Ethiopia with WMO, a medium-term mission was organized to Ethiopia in October/November 1983. The object of the mission was to provide practical training and guidance in aspects of operational agrometeorology with particular reference to drought assessment, erosion, occurrence of dry spells and desertification. The mission was considered extremely useful by the Permanent Representative of Ethiopia. WMO plans to continue this programme.

Roving Seminar on Desertification

A roving seminar to train participants in the use of meteorological data and information in the assessment and combat against desertification was organized in Tanzania and Ethiopia in 1983. The seminar dealt with the analysis of rainfall intensity observations to assess measures to combat soil erosion. Similar seminars were held in Guinea Bissau, Gambia and Morocco, in early 1983.

It is planned to continue this programme in other desert-prone areas in Latin America and Africa during 1984 and 1985. Further topics are: the use of wind data to estimate wind erosion and to promote the stabilization of sand dunes; the estimation of livestock carrying capacity of natural pasture; and the water use and water requirements of crops under irrigation.

Publications

WMO has, in collaboration with UNESCO, prepared a draft report on the

"Hydrological Aspects of Drought—The Recent Drought in Tropical Areas". This report is now being processed for publication. Another report entitled "Hydrological Aspects of Desertification" is also nearing completion.

ILO

Three ILO-assisted Special Public Works Programmes are at present being implemented in the Sudano-Sahelian region in the Cape Verde Islands, Mali and Burkina Faso. In these countries, where extreme poverty is aggravated by recurrent droughts, a number of SPWP works were designed to support national policies of desertification control, mainly: the provision of firewood and domestic sources of building timber and the productive use of rain and ground water. In line with these objectives, most SPWP schemes involve the establishment of small-scale infrastructure. Small hillside dams, flood control and land reclamation works have been implemented to reduce flooding. Anti-erosive dykes, reforestation and other protection works have been carried out to stop erosion, whilst spring catchments and wells (in Burkina Faso) provide water to the population.

All these schemes were located in areas meeting two essential criteria: the availability of labour and other local resources enabling the use of productive labour-intensive methods; and, the selection of works primarily benefiting the neediest segments of the population. Great care was also taken to ensure that the local communities were fully involved in the project identification process. This brought about additional grass-root contributions, such as voluntary labour and local materials. Appropriate steps have been taken to maximise proper post-project maintenance. At this stage, there are strong indications that the projects will be actively supported by the population involved.

In each country, projects specifically worked out to counteract the desertification processes amount to about US\$1 million. They are intended to provide employment for between 600 to 1,000 workers annually during the three-year construction phase of the SPWP's. A major benefit of these schemes will also be to improve directly women's working conditions with a ready drinking water supply and domestic energy source.

WFP

WFP project assistance is at present being provided in respect of 55 projects which are principally aimed at combatting desertification. The total cost to the programme of these projects is in the neighbourhood of \$733 million; and they cover such

activities as reforestation with special species, dune fixation, terracing, watershed protection, grazing control and the planting of windbreaks.

Food aid is used to provide the equivalent of wages for the work forces needed for carrying out the varied activities involved in soil conservation.

The poor rural population of Ethiopia, for example, has been mobilized on a massive scale to combat the widespread degradation caused by overgrazing and tree cutting, and is receiving badly needed food aid from WFP for a project aimed at the rehabilitation of affected areas. The first phase of the project having shown very impressive results from WFP's investment of \$80

million, the second phase, costing WFP just over \$88 million, began early last year.

WFP's China Programme began in 1979 with assistance to Indo-Chinese refugees in the south of the country. The main emphasis since 1981, however, has shifted to northern China and efforts concentrate on anti-desertification activities such as tree planting to protect soils from erosion, rehabilitation of degraded lands and improved drainage of irrigated land to prevent salinization and waterlogging. By the end of 1983, WFP was operating in 17 different provinces and autonomous regions or municipalities and had approved support for a further 20 projects for which some US \$200 million worth of food has been committed.



WFP has been funding a very successful programme of terracing in Ethiopia. Here a technician explains to the workers how to build the foundation for a terrace. (UNEP/Charles Stewart)

Anti-desertification related projects which have recently been approved for implementation include:

- forestry development in the Indian states of Bihar, Orissa and Madhya Pradesh for a period of five years costing US \$84 million. The three projects aim at using forest development programmes to improve the socio-economic conditions of caste and tribal groups in the region;
- forestry development and control of soil erosion in Morocco for five years at a cost of US \$27.4 million;
- a tree and shrub planting programme in Tunisia for four years at a cost of US \$14.4 million;
- a four year programme in Bolivia costing US \$9 million involving, *inter alia*, soil conservation and afforestation;
- US \$4 million for five years for a project in Kenya covering irrigation, forestry and livestock improvement;
- two projects for three years in the Henan and Anhui provinces of China costing US \$22.8 million involving agricultural development through improved drainage schemes and irrigation.

UNIDO

UNIDO undertakes antidesertification-related projects in several areas including: water resources management (in Mali, Somalia, Burkina Faso, Mexico, Egypt and Senegal); fertilizers and pesticides (in Syria, Egypt, Sudan and on regional levels in Africa, Arab countries and OCAM countries); development of renewable and low-cost energy sources (in Mali, Niger, Burkina Faso, Sudan, Ethiopia and Jordan); and, manufacture of small agricultural implements in several countries.

ESCAP

In co-operation with the USSR Commission for UNEP and with financial assistance from UNEP's Desertification Branch, ESCAP organized a study tour on desertification control in the USSR Central Asian Republics in October-November 1984. The purpose of the study tour was to: (1) provide scientists of the developing countries of the ESCAP region an opportunity to observe the achievements accomplished by the USSR Government in the implementation of the Plan of Action to Combat Desertification; (2) foster exchange of views and experiences amongst scientists; (3) contribute to exchange and dissemination of information; and (4) assist Governments in developing and/or strengthening national capabilities to deal with problems of desertification control, management and development of arid and semi-arid lands, and implementation of the PACD.

ECA

Recent work by the ECA in the field of desertification control included preparation, in co-operation with UNEP, of the *Assessment of the Current Status and Trend of Desertification in the Kalahari Desert Region Countries* for the 1984 review of implementation of the Plan of Action to Combat Desertification.

A report was prepared on *Environmental problems of underground water exploitation*, a technical study mission report on three countries (Morocco, Egypt and Sudan).

Other projects included the planning and development of hydro-meteorological networks and related services in Africa, July 1980—November 1983, and the Regional Workshop on Modalities of Exchange of Information and Expertise on Desertification Control and Technology in Africa planned for 1984-1985.

ECWA

A case study on Agricultural Resource Management and Desertification Control in Iraq has been completed. This study examines the physiographic, climatic and phytogeographic features of Iraq and its water resources potential and in this context assesses the state of current agricultural resource use and the extent and rate of desertification. The study also identifies constraints confronting agricultural development in Iraq and outlines an action programme for the enhancement of agricultural production and control of desertification.

A study on pastoral and livestock management systems and strategies in the ECWA region has also been completed. It reviews and synthesizes varied approaches and practices applied in range and livestock management in the ECWA region, delineating points of successes and failures; examines in depth the problems faced by nomadic and transhumant livestock breeders; outlines measures for the overall improvement of range-livestock systems of the ECWA region and identifies a number of technical assistance projects.

The ECWA/FAO Joint Agriculture Division participated in an interagency technical programming and project formulation mission launched by UNEP to Jordan. The mission formulated strategic guidelines for range lands development in the eastern low rainfall areas of Jordan and a range rehabilitation project for the Lajjun area in south-eastern Jordan.

An analysis of ECWA programmes having a bearing upon desertification control was carried out for the UN Compendium of desertification projects and programmes.

Technical assistance was rendered to UNEP towards preparation of a field manual

on economic analysis of desertification control projects.

ECWA participated in the UNEP expert meeting on the development of a regional research and training programme on desertification control in the ECWA region, held in Aleppo, Syria, from 27 February to 1 March 1984.

UNSO

In 1983, UNSO, through the United Nations Trust Fund for Sudano-Sahelian Activities, mobilized and allocated for desertification control funds amounting to \$15.5 million, bringing to \$62.5 million the total resources mobilized by UNSO since the start of its desertification mandate in 1979. Of this, \$40.7 million was provided through the Trust Fund.

The main thrust of UNSO's anti-desertification operations has been in the areas of deforestation control, range management, water resources management, soil protection and sand dune fixation, and planning and co-ordination. There has been a particularly heavy emphasis on deforestation control, the cutting of trees and woody shrubs for fuelwood and construction purposes being one of the principal causes of desertification. UNSO has been trying to combat deforestation through forestry projects, the development of renewable alternatives to fuelwood, the promotion of fuel efficient stoves, and bush fire control. In these and other areas, UNSO has continued to emphasize the involvement of the people affected in the planning and implementation of projects. It has also continued to work with the Governments and populations of the region raising consciousness of the importance of desertification, the preparation of national plans or strategies for desertification control and the establishment or strengthening of the necessary institutional machinery.

UNSO sponsored with the International Trade Centre a seminar in Senegal on the latest developments concerning gum arabic research, production and marketing. With UNEP, ECA, WMO, FAO, and the OAU, UNSO also sponsored and participated in a series of meetings culminating in a scientific round table on the climatic situation and drought in Africa which, *inter alia*, produced a draft Regional Plan of Action to Combat the Impact of Drought in Africa. In co-operation with UNEP, UNSO commissioned and helped prepare; (a) a survey in the Sudano-Sahelian region of information and experiences on desertification control technology, successes and failures, and techniques suitable for duplication in other countries; and (b) a directory of national and international institutions in the Sudano-Sahelian and adjacent countries involved in desertification control research, training and implementation. This regional survey and directory will form part of a consolidated survey and directory for Africa, which UNEP is preparing.

Finally, UNSO commissioned and helped in the preparation of an assessment of desertification in the Sudano-Sahelian and adjacent regions seven years after the adoption of the Plan of Action. Sets of indicators of the degrees of desertification show that for most countries, the overall state of desertification has worsened. Some of this may be due to the continued drought. The most successful areas in which the Plan of Action has been carried out have been in sensitizing governments and local populations on the importance of

anti-desertification measures and national planning as well as institutional machinery, projects with a specific focus such as sand dune fixation, and projects with the involvement of the people affected. The assessment also concludes that efforts should be made to develop supplementary and alternative livelihood systems where present ways of resource utilization cannot be sustained on an ecologically sound basis.

At the twelfth session of UNEP's Governing Council it was decided to include Ghana and Togo among the countries eligible to receive assistance from UNSO.

News of Interest

Seeds of Despair

While in Ethiopia making a film on desertification as part of a UNEP project director Charles Stewart met a starving family who had walked 120 kilometres to a relief centre in search of food. He broke off filming the long term project to cover the famine currently affecting over six million people in Ethiopia. What he saw and learned about the tens of thousands of undernourished people flooding into relief centres is vividly shown in the documentary "Seeds of Despair". Since the showing of the film in July the Disaster Emergency Committee, set up in the UK to channel contributions to drought-stricken parts of Africa, has topped \$11 million. The film has also been shown in other European countries and is sparking a lively debate about the pros and cons of famine relief as opposed to development assistance. The film on desertification is due to be televised in mid-1985.

The Land Imprinter

Desertified surfaces, that often are barren, smooth and compacted, cannot absorb water when it falls as rain or washes over the land because the surface is too hard. Consequently, much of the rainwater runs off with resultant erosion and flash flooding. The small amount of rainwater that does infiltrate penetrates the soil superficially and is soon lost as surface evaporation. Loss of rainwater and topsoil further increase land barrenness and accelerate desertification, thereby setting in motion a vicious circle of land degradation. Thus controlling water infiltration into the earth is a prime concern in reversing desertification.

Infiltration may be defined as the exchange of rainwater and soil air across the air-earth interface (soil surface). Natural surfaces funnel

rainwater rapidly into the soil and allow soil air to escape so that the soil can soak up the water. Hard desertified surfaces must be modified in some way to allow this interchange, but also in such a way to prevent any further erosion. A system has been devised to do just that, called land imprintation.

Imprintation is a mechanical process that transforms the smooth, sealed desertified soil surface into a rough, open surface that can soak up rainwater as fast as it falls. Imprinters force angular metal teeth into the soil surface to shape the fluid exchange funnels that are needed for subsurface water-air exchange. Imprinters range from hand operated devices appropriate for labour intensive situations to massive tractor-powered machines requiring little labour but important capital investment. Unlike conventional tillage methods, imprinters do not invert topsoil, cover protective plant materials, or make continuous furrows that can bleed rainwater off the land. Funnel shaped imprints serve to concentrate water, seeds, litter and topsoil together where they can work in concert to effect seed germination and seedling establishment. A system of seed dispersion can be integrated with the imprinting process itself. The resultant plant communities then maintain an open air-earth interface that can soak up heavy rainfall to prevent runoff and erosion.

For further information interested readers can write to Robert M. Dixon, USDA, 2000 E. Allen Rd., Tucson, Arizona, 85719, USA

Two useful wild plants from Israel

Studies conducted by J. Orev of Beer Shiva showed that a wild shrub, *Haloxylon persicum* var. *idumaeum*, has a high growth potential for use as firewood in arid areas. Growing in the area between the Dead and Red Seas (30-45 mm annually), clippings of a

single shrub gave a yield of 4 kg of dry matter in one year and of 6 kg in two years. Assuming a plantation density of 200 per hectare an average annual yield of 660 kg of dry matter is feasible on a three year cutting cycle (2 cuts, one rest). Converted to gas, this is about equal to 200 litres of diesel fuel.

A perennial grass, *Hypparrhaenia hirta*, found formerly in the rocky soils of the Lakhish region (450 mm rainfall) has crept southwards along highways towards Beer Shiva in the Negev (200 mm). Plants sown in an area of 100 mm average annual rainfall are well established after three years. This grass can supplement the low energy but high protein *Atriplex halimus* to provide a complete pasture in 80-200 mm rainfall areas.

Millions of Trees Clubs

The Millions of Trees Clubs is the Department of Youth and Environment in the Youth Hostel's Association of India, which is affiliated to the International Federation of Youth Hostels with a membership of 4 million in 58 countries. It was established following the call for massive reforestation made by the Prime Minister of India in 1980.

The Club works on the principle of popular involvement and mobilization of rural peasants and youth. People's nurseries and labour brigades are set up in villages every 16-25 km apart which are run by the poorest marginal farmers on a self-employment basis. Replanting is decentralized around these nurseries, which are also responsible for supervising social forestry activities within a radius of about 15 km of the settlement. In Harekala and Muloor villages near Mangalore in southwestern India, for example, 400,000 and 250,000 trees respectively are now coming up as part of the Millions of Trees programme. The nurseries also become the training centres for farmers in



The Millions of Trees Club of India is organizing rural farmers and school children to establish tree nurseries to mobilize massive tree planting campaigns. (Photo/Ben Soans)

the surrounding areas where they can learn planting techniques and experiment with different tree species.

As part of the United Nations International Year of the Youth in 1985 school children are going to be integrated into the Millions of Trees Club activities. They will receive training in people's nurseries and then each plant a seed bed near their own homes of 10 by 3 feet. In this way hundreds of thousands of tree seedlings can be produced to create wood lot plantations in participating areas. If the programme is successful fuel wood will become available to many people who now must burn dung and Indian forests will once again grace a landscape that in recent times has become more barren with every passing year.

CAZRI

The Central Arid Zone Research Institute of Jodhpur, India, informs us that they have started a small cell which is totally devoted to monitoring the desertification

process. They hope to conduct long term studies in the Rajasthan Desert. We hope that other national institutions in countries affected by desertification who have not already done so will emulate CAZRI's action to combat desertification.

National Seminar on Development of Sandy Deserts in Pakistan

The Cholistan Institute of Desert Studies, a unit of Islamia University, Bahawalpur, Pakistan, is organizing a seminar on desertification scheduled to be held in March of 1985.

ELC, Nairobi

Non-Governmental Organizations' actions in combating desertification in Niger, Senegal and Burkina Faso— a report on a UNEP/ELC mission undertaken in July 1983.

Anti-desertification activities of NGOs in the Sudano-Sahelian region are quite diverse in terms of how

they relate to the local population and to the national governments.

Despite financial and managerial constraints NGOs are flexible and diverse enough to be able to adapt and reach rural populations in many regions and to undertake large projects at low cost compared to projects undertaken by bi- and multi-lateral aid agencies.

Two types of NGOs work at the grass-root level in the Sahelian zone:

- internationally based NGOs, usually European or North American; and
- national NGOs founded and managed by nationals.

International organizations, such as CARE or L'Association Francaise des Volontaires du Progres, are the majority, except in Senegal where national NGOs constitute 60 per cent of the total. In each country visited, there is a special organization which tries to co-ordinate actions among NGOs and to

establish links between NGOs and the governmental branches dealing with development matters. They can also represent NGOs vis-à-vis donor agencies, or act as an arbitrator in case of conflict with the local authorities. They do not work directly in the field and are the administrative representation of NGOs in a country. They are called the "National network of NGOs". There are approximately twenty operational NGOs in Senegal, twenty in Niger and roughly forty in Upper Volta.

Types of Activities

The main problems faced by rural people in the Sahel is the decrease of food production and the availability of water. Their activities are directed towards improvement in these areas and not directly against desertification.

NGOs, on the basis of the needs of rural people, work mainly in the fields of:

- reforestation, with special attention given to the young trees;
- dry season market gardening, an activity with several positive aspects: increase of the food production, raising of family income, and work during the dry seasons, which reduces emigration to urban centres by the male population.

Other specific activities include:

- integrated projects (health, education, water supply and conservation reforestation);
- establishment of windbreaks for sand dune stabilization and for the improvement of crop yield.

Relations between local populations and NGOs

The significant presence of NGOs in Sudano-Sahelian region at present is due to humanitarian food aid which was particularly necessary after the 1973 drought.

Initially, NGOs were preoccupied with activities

related to self-sufficiency in food production and water supply. Increasingly, however, it has become necessary to incorporate sociological factors within NGOs activities which has meant a greater involvement of local populations in NGO projects. Several NGOs now go into the villages and to formulate their projects on the spot in order to ensure that maximum motivation and participation from the villagers is obtained.

Relations Between NGO's and Governments

These relations depend heavily on a given government's socio-economic and political orientation. In some countries, the government will trust in NGOs competence and consider them as partners in progress. In this case, NGOs are free to set up operations and to work wherever they may choose. In other cases, the government controls NGO activities and will integrate the project with the National Plan. All projects must therefore obtain the agreement of the concerned government branches before implementation. In the three countries visited, all of the NGOs wished to work in co-operation with government services.

Management of NGO Projects

The contribution of NGOs to government financing of anti-desertification projects is quite significant. In the three countries under study, their contribution has varied between US \$8.5 million to US \$15 million annually, sometimes reaching 10 per cent of the total national budget.

Nevertheless, NGOs are by their nature obliged to adapt to resource fluctuations and have to be quite flexible in their financial management due to their unpredictability of funding. As a result, NGO projects tend to be modest and their administration suffers from a perpetual shortage of

capital. NGOs in the Sudano-Sahelian Region face three urgent problems in the fight against desertification:

- financial constraints due to donor inflexibility in funding policy. NGOs often have a weak administrative structure because they are small. Donor agencies are generally unwilling to provide funds to such organizations. They prefer to fund a few large scale projects rather than many small scale ones. The problem is more a question of access to capital than availability of capital;
- lack of communication of information concerning national and regional NGO activities. Field experience needs to be shared among NGOs and advertised to other parties concerned (bilateral and multilateral agencies, governments and NGOs working elsewhere). To improve the situation, the Environment Liaison Centre recommends that national studies listing all field projects should be undertaken, in order to circulate information amongst all the parties involved.
- lack of dynamic support from the "National Networks" (as defined above). Since such networks have been created to facilitate the introduction of NGOs into a country or to act as intermediaries between governments and NGOs, they can also serve as an administrative structure of NGO activity co-ordination as well as an introductory structure to all those interested in NGO activities. Stronger networks could become as a sort of "clearing house". Taking into account the increase of finances that such an improvement requires, ELC is recommending that networks' funds should be reinforced.

The report concludes: "The recommendations (made by

ELC) reflect NGOs' needs which, when met, will increase their ability to function as part of an integrated approach to solving the problem of desertification".

Copies of the report can be made available on request from the Desertification Branch in either English or French.

WCB/ISEE

A new environmental organization called the World Council for the Biosphere/International Society for Environmental Education (WCB/ISEE) was founded in October 1983 in the United States. It is an international organization associated with the Foundation for Environmental Conservation, based in Geneva, and it is affiliated with the Asian Environmental Society, Indian Environmental Congress Association, Indian Environmental Society, Indian Society of Naturalists, Nepal Environmental Conservation Group, North American Association for Environmental Education, Northwest Association for Environmental Studies (USA) and Society for a Clean Environment (India).

As its two-pronged name implies, the organization has two main aims. The WCB will function as an environmental think tank, while the ISEE is a consortium of organizations and individuals involved in environmental education. The groups will work together to foster education for ecologically sustainable development. WCB/ISEE plans to develop and disseminate educational programmes on the importance of maintaining the earth's life support systems and how development affects those systems. It will call attention on types of development that can cause those systems to break down, and it will encourage more ecologically benign forms of economic development.

The first general meeting of

the WCB/ISEE was held from 1-8 June 1984 in New Delhi, Udaipur and the Kashmir Valley, India. The first three days were held in New Delhi and work was devoted to organizational matters, deliberations of the Council and formal presentation of invited papers and reports on various environmental concerns. Another three days in Udaipur was spent setting goals and initiating the first educational projects. The meeting finished by a Study Tour in the Kashmir Valley.

Club du Sahel

The role of the "Club du Sahel", established in 1976, is to support the work of the CILSS (Comité Permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel/Permanent Inter-State Committee to Combat Drought in the Sahel), to facilitate the mobilization of resources for the development of CILSS Member Countries (Cape Verde Islands, Chad, Gambia, Mali, Mauritania, Niger, Senegal and Burkina Faso), to provide information on the Sahelian states and to serve as a forum for dialogue on the perspectives and needs of Sahelian development. The Club is a flexible association for concertation among the Sahelian countries and all governments and public organizations interested in the development of this region. The Secretariat is located in Paris at the headquarters of the Organization for Economic Co-operation and Development (OECD).

The Fifth Club du Sahel Conference was held 26-28 October 1983 in Brussels at the headquarters of the European Communities Commission. The Sahel countries sent their Rural Development Ministers as delegates and development agencies sent high level representatives who were well acquainted with African and Sahel problems. The discussions focussed primarily on the overall situation in the Sahel countries at the start of the decade and on future

prospects. They concluded that the situation is not very encouraging.

If the main economic, financial, social and ecological trends are not reversed, the outlook for the future is dark. The delegates concluded that production is not keeping pace with population increase, desertification is spreading, the international economic situation is having negative repercussions in the region, and internal management of affairs is in need of improvement. The Club du Sahel and CILSS Secretariat agreed to work together to develop and implement appropriate food strategies and to continue to meet regularly to co-ordinate development activities through discussions and exchanges of view points.

ACSAD

The Arab Centre for the Studies of Arid Zones and Dry Lands (ACSAD) is an intergovernmental autonomous organization established by the League of Arab States in 1971 with headquarters in Damascus, Syria. ACSAD is governed by a Board of Directors made up of a representative from each member Arab State. ACSAD's main objectives include regional research studies and development programmes related to arid zones and dry lands such as water and soil resources, plant and animal production, agro-meteorology and social studies. In addition, emphasis is directed towards training scientists and technicians and the exchange of knowledge and experience in the region.

Regular publications include research papers, scientific and technical reports and occasional publications include bibliographies, monographs, project technical and economic reports and other miscellaneous publications. They are available on request on an exchange basis and free of charge. The address is: ACSAD, P.O. Box 2440, Damascus, Syria.

Of particular interest is the

launching of a new periodical in April 1984 entitled *Camel Newsletter*, due to a greater recognition of the camel's vital role in the drylands of many parts of the world (see *Desertification Control* No. 8 for an article on the subject). The newsletter will be published twice a year.

ACSAD will be hosting an International Animal Production Conference in Arid Zones from 7-12 September 1985. The conference will focus attention on the potential of arid regions for animal production for the benefit to the people living there and the many unsolved problems in arid climates pertaining to camels, goats and sheep.

Scientists interested in presenting papers are invited to submit titles of their intended presentations to reach the address given below no later than 31 January 1985. The general topics include: 1) Breeding and genetics, 2) Nutrition, 3) Reproduction, 4) Production, 5) Socio-economic aspects and 6) Health and management. For further information on the conference please write to:

Dr. Ousama A. Awa
Secretariat, International
Conference on Animal
Production in Arid Zones
Director, Animal Sciences
Division
ACSAD
P. O. Box 2440
Damascus, Syria

or

Prof. Dr. Christian Gall
Chairman, Advisory
Committee of
International Conference
on Animal Production in
Arid Zones
Centre for Agriculture in the
Tropics and Subtropics
Institute for Animal
Production in the Tropics
and Subtropics
University of Hohenheim-480
P.O. Box 700562
7000 Stuttgart 70
West Germany

Arid Lands Conference in 1985

As part of the Centennial Year Celebration at the University of Arizona (USA) an international conference co-sponsored by the university and UNESCO entitled: "Arid Lands: Today and Tomorrow" will be held 20-25 October 1985. Discussions will focus on water use, conservation, agricultural systems, natural resource reclamation and utilization, and the human habitat.

Other events will include a trade fair of technologies appropriate for arid regions, the premiere showing of the 1985 Centennial film on the Sonoran Desert, a series of films from around the world, publisher's book displays, field trips and special meetings of task forces and international co-operative programmes.

Prospective participants interested in presenting a paper should send the following information in English, French or Spanish: title of paper; name, affiliation, and address of author(s) (underline name of presenter); and a 200 word abstract. Send abstract (no later than 15 December 1984) and other enquiries to Dr. G.P. Nabhan, Office of Arid Land Studies, University of Arizona, Tucson, AZ 85721, USA.

Desertification Branch Publications

A report entitled "Activities of the United Nations Environment Programme in the Combat Against Desertification" has recently appeared. The report contains summaries of 25 projects undertaken by UNEP to combat desertification from 1973 to mid-1983. It also contains sections summarizing projects implemented through the Consultative Group for Desertification Control (DESCON) and UNEP assisted UNSO projects in the Sudano-Sahelian region. A

compendium of publications, reports and studies is also presented. The report concludes that UNEP spent \$20,227,961 during this period on antidesertification activities which were carried out in 29 countries on four continents.

Soon to appear is a report entitled "Research and Training for Desertification Control: the UN Effort". The report was prepared for presentation and discussion at the Workshop on Institutions of Specific Research and Training Programmes held in Paris 2-4 November 1982. The report will be used as a guideline to formulating research and training plans and programmes within the UN system directed towards desertification control.

A two volume publication representing the output of implementation of Governing Council decision 10/18, para. 5 is nearing completion. The decision requests the Executive Director of UNEP to provide additional resources to facilitate the process of exchange of information and expertise among the countries of the Sudano-Sahelian region and between them and other countries in Africa which have similar problems. The publication, entitled *Promotion of Exchange of Information and Expertise on Desertification Control and Technology in Africa*, contains a summary of activities undertaken to combat desertification on a country by country basis in Volume I, *Action and Directory of Institutions, Experts and Scientists involved in Desertification*, Volume II, lists institutions and governmental departments which are involved in anti-desertification activities.

These publications are or will be available on request from the Desertification Branch free of charge.

Drought Prediction in the Sahel

Hugues Faure, from the Centre National de la Recherche Scientifique (CNRS) and University of Marseille-Luminy (France), and Jean-Yves Gac, a geologist at the Office de la Recherche Scientifique et Technique Outre-Mer (ORSTOM) in Dakar (Senegal), have shown that the Senegal river discharge, measured since the beginning of this century, shows a cyclic pattern.

The drastic sahelian drought has a 31 year return cycle (around 1913, 1941, 1975), but the anomalous years of river discharge (25% above or under the mean) show a 10.4 year cycle almost identical to the sunspot cycle during the same period.

An extrapolation of the curves shows that the present drought should end around 1985. But these better conditions could probably cease at about 2005 with the beginning of a new drought. They suggest that a fight against this future drought should be prepared during the period of propitious conditions.

Studies are going on at CNRS and ORSTOM in connection with universities of the Sahelian countries and various organisms to extend research on cycles of different nature. Various time scales are considered during Quaternary and recent periods. The project is named CYCLARID.

Erratum

The correct title of the article on Swaziland in *Desertification Control* No. 9 should have read "A spatial analogue model of potential desertification in Swaziland". The word 'model' was inadvertently omitted. The second author was G.F. Schmidt, not C.F. Schmidt as printed. The Editors apologise to the authors for the mistakes.

UNITED NATIONS REGIONAL ECONOMIC COMMISSIONS

In the Bulletin's news sections and articles reference is sometimes made to organizations whose acronym begins with an 'E', such as ECWA and ECA. For those readers who are unfamiliar with the UN regional economic commissions we present here their names, addresses, date of formation and membership.

REGIONAL ECONOMIC COMMISSIONS

ECONOMIC COMMISSION FOR EUROPE—ECE

Palais des Nations, 1211 Geneva 10, Switzerland

ECE was established in 1947. Representatives of all European countries and of the United States and Canada study the economic and technological problems of the region and recommend courses of action.

MEMBERS

Albania	Federal Republic of	Portugal
Austria	Germany	Romania
Belgium	Greece	Spain
Bulgaria	Hungary	Sweden
Byelorussian SSR	Iceland	Switzerland
Canada	Ireland	Turkey
Cyprus	Italy	Ukrainian SSR
Czechoslovakia	Luxembourg	USSR
Denmark	Malta	United Kingdom
Finland	Netherlands	USA
France	Norway	Yugoslavia
German Democratic Republic	Poland	

ECONOMIC COMMISSION FOR AFRICA—ECA

Africa Hall, P.O.B. 3001, Addis Ababa, Ethiopia

ECA was founded in 1958 by a resolution of ECOSOC to initiate and take part in measures for facilitating Africa's economic development.

MEMBERS

Algeria	Equatorial Guinea	Mali	South Africa*
Angola	Ethiopia	Mauritania	Sudan
Benin	Gabon	Mauritius	Swaziland
Botswana	The Gambia	Morocco	Tanzania
Burkina Faso	Ghana	Mozambique	Togo
Burundi	Guinea	Niger	Tunisia
Cameroon	Guinea Bissau	Nigeria	Uganda
Cape Verde	Ivory Coast	Rwanda	Zaire
Central African Republic	Kenya	São Tomé and Príncipe	Zambia
Chad	Lesotho	Senegal	Zimbabwe
Comoros	Liberia	Seychelles	
Congo	Libya	Sierra Leone	
Djibouti	Madagascar	Somalia	
Egypt	Malawi		

* Suspended since 1963

ECONOMIC COMMISSION FOR LATIN AMERICA AND THE CARIBBEAN – ECLAC

**United Nations Building, Avenida Dag Hammarskjold, Casilla 1790,
Santiago, Chile**

Founded 1948 to co-ordinate policies for the promotion of economic development in the Latin American region.

MEMBERS

Argentina	Costa Rica	Guyana	Paraguay
Bahamas	Cuba	Haiti	Peru
Barbados	Dominica	Honduras	Spain
Belize	Dominican Republic	Jamaica	Suriname
Bolivia	Ecuador	Mexico	Trinidad and Tobago
Brazil	El Salvador	Netherlands	United Kingdom
Canada	France	Netherlands Antilles	USA
Chile	Grenada	Nicaragua	Uruguay
Colombia	Guatemala	Panama	Venezuela

**ECONOMIC AND SOCIAL COMMISSION FOR ASIA
AND THE PACIFIC – ESCAP**

**United Nations Building, Rajadamnern Avenue,
Bangkok 2, Thailand**

Founded in 1947 to encourage the economic and social development of Asia and the Far East. The title ESCAP, which replaced ECAFE, was adopted after a reorganization in 1974.

MEMBERS

Afghanistan	India	Mongolia	Solomon Islands
Australia	Indonesia	Nauru	Sri Lanka
Bangladesh	Iran	Nepal	Thailand
Bhutan	Japan	Netherlands	Tonga
Burma	Kampuchea	New Zealand	USSR
China, People's Republic	Korea, Republic	Pakistan	United Kingdom
Fiji	Laos	Papua New Guinea	USA
France	Malaysia	Philippines	Viet-Nam
	Maldives	Singapore	Western Samoa

ASSOCIATE MEMBERS

Brunei	Hong Kong	Trust Territory of the Pacific Islands	Tuvalu
Cook Islands	Kiribati		Vanuatu
Guam	Niue		

**ECONOMIC COMMISSION FOR WESTERN ASIA – ECWA
P.O.B. 27, Baghdad, Iraq**

Established in 1974 by a resolution of ECOSOC to provide facilities of a wider scope for those countries previously served by the UN Economic and Social Office in Beirut (UNESOB).

MEMBERS

Bahrain	Lebanon	Saudi Arabia
Egypt	Oman	Syria
Iraq	Palestine Liberation Organization (PLO)	United Arab Emirates
Jordan	Qatar	Yemen Arab Republic
Kuwait		Yemen, People's Democratic Republic

Book Reviews

Dregne, H.E.

Desertification of Arid Lands

Hardwood Academic Publishers
1983, 242 p.

The book by H.E. Dregne is well timed as it coincides with the first general assessment of progress in the implementation of the Plan of Action to Combat Desertification agreed to at the UN Conference on Desertification in 1977. Dregne, an experienced teacher, a recognized researcher on arid lands and a contributor of long standing to the dialogue on desertification, is eminently qualified to author yet another scientific treatise on the subject. One should, however, hasten to point out from the outset in this review that while the book is a scientific work the material is rendered in a lucid, factual, concise, informative and authoritative style as the author treats the subject under its main aspects, namely, desertification processes, indicators, cause and effect, prevention and reversal, and occurrence. The suggested procedures for assessing and controlling desertification are "simple enough for a non-specialist". This book should therefore be suitable for use by policy makers, planners and technical managers in charge of projects; a reference text by University Departments of Environmental Studies/Faculties of Earth Sciences, and scientists engaged in the multi-disciplinary research related to desertification.

In introducing the subject of desertification Dregne sets it out in an international framework and historical perspective, suggesting that the "decade of the 1950's witnessed the first world effort

to call attention" to problems of desertification. Reference to world events like major droughts of the 1930s in the US 1911-1914 in the African Sahel and again in the early 1970s, provides some useful milestones in tracing the build-up to world concern about desertification. Against this background useful concepts like a definition of desertification (though "there is no generally accepted definition of desertification"), and drought, and the extent and impact of desertification are presented early in the book to facilitate their usage and reference which occurs in the rest of the book. Man's role in the phenomenon of desertification is also introduced effectively in historical perspective by making reference to the occurrence of the phenomenon in the ancient agricultural regions of the world, namely, Roman Mediterranean, Mesopotamia and China. Dregne uses this ancient experience with desertification to introduce the desertification processes: waterlogging and salinization on irrigated land, overgrazing, overcultivation, wood cutting, soil compaction, and soil erosion of the rangelands and rainfed croplands. The problem of desertification is also treated in terms of its extent, impact and costs, all of which are illustrated extensively with tabulated statistical material and figures in the text.

The treatment of the subject in Chapter 2 focuses on the principal "four desertification processes having the most extensive impact on the biological productivity of land degradation of vegetative cover, soil erosion, salinization and waterlogging, and soil compaction". The mechanisms of desertification, their complex

interaction and interlinkages, consequences, as well as long term impact on the ecosystems and potential of plant and animal productivity are dealt with in the chapter. The presentation is a good background and useful guide to managers, planners and policy makers on appropriate land use practices for the control and prevention of desertification. Chapter 3 on "Desertification Indicators" presents the diagnostic tools suggested for the measurement and interpretation of desertification conditions. Desertification indicators are introduced for the purpose of aiding researchers, managers, planners and policy makers to estimate how much land degradation has occurred in the past and what effect current management practices are having on the range condition, rainfed croplands and irrigated lands. Dregne makes the point very early in the chapter that: "While the measurement of desertification indicators should be simple enough for a non-specialist to carry out, the interpretation of the significance of the condition measured must be done by an experienced individual". It is in this part of the book where treatment inevitably gets involved in the intricate concepts of measurement scales, critical levels, monitoring, assessment, interpretation and mapping of the desertification indicators, and therefore where the book demands careful and critical reading. Clearly the successful application of the suggested methodologies and measurement procedures will require proficiency and familiarity with scientific research methods on the part of the readers. However, the critical role of reliable indicators for measurement of desertification remains key to the combat and control of

desertification. Dregne underscores this by an apt remark in his conclusion: "Reliable indicators of change over relatively short periods of time are needed to determine whether correct management practices are beneficial, harmful, or of a neutral character".

In Chapter 4 the "Cause and Effect" of desertification is dealt with, returning to the description of the processes of desertification mentioned in Chapter 2, but examining their incidence in various parts of the world and citing specific examples in countries like Iran, Iraq, Niger, Australia, United States, Chile, China and the Soviet Union. The discussion affirms the role of man in bringing about desertification for reasons which include "excessive human population", "exploitation philosophy that sees land as a limitless resource", "land tenure systems", "lack of technical advice on how to control desertification", "high prices for grain and meat" and "weakness or non-existence of laws and regulations governing land abuse". Dregne concludes that "the causes of desertification vary from place to place and from time to time", but concedes that "the reasons why land degradation has occurred in different places varies even though the causes (overgrazing, drainage, etc.) may be the same". In Chapter 5, on "Prevention and Reversal of Desertification" various remedial, control and preventative strategies are discussed; underlining the need "to concentrate first on protecting and improving the good land rather than the poor land" as recommended by the United Nations Conference on Desertification. Some of the key recommendations and guidelines for

anti-desertification control programmes and activities are reiterated forcefully, for example; "anti-desertification programmes must be part of a broader development programme that is designed to bring about improvement in rural conditions of health, education, communication and welfare". Emphasis must be placed on involving the local population in project formulation and implementation. The author recognizes that several global and country-specific constraints hamper desertification control efforts, but submits that these are circumventable.

The book ends with Chapter 6 highlighting the "Occurrence of Desertification" at the global level, illuminating the varying degrees in which it affects the major world arid regions in Africa, Australia, Asia, North and South America. One cannot but agree with Dregne's indictment that "man has been a poor steward of his environment in the arid regions of the world. Only in places where the environment is too inhospitable for large scale development, such as in the Sahara or in the polar deserts, has the imprint of man been insignificant".

The author has provided at the end of each chapter a wealth of references to the subject of desertification, and this makes the book a very useful reference text. Tables are used to illustrate the subject matter under discussion; similarly maps are provided to support treatment of the desertification problems at country, regional and global level. It would, however, have been helpful if an indication was made of sources, time frame, and methods of deriving the data used in the tables, particularly those which tend to generate controversy among the scientists involved in the desertification dialogue. For example, Table 6.5 on Arid lands affected by desertification in Africa raises several questions. Mozambique, Swaziland, and

Zambia, not listed in the Table, have important irrigation projects; Zimbabwe is listed as having zero irrigated land though an estimated 110,000 hectares of irrigated land was reported in existence in 1982 as many commercial farmers practise supplementary irrigation. The total figures of desertified land in Africa would therefore appear incomplete. Undoubtedly the figures in this table and other tables in the book are not static and will naturally be updated from the countries and desertification data banks maintained by UN agencies and other research organizations.

S.S.S.
L.N.L.

Tolba, Mostafa Kamal

Earth Matters: Environmental Challenges for the 1980s

Selected and Edited by
Robert Lamb and Patrick
Allen
Nairobi, UNEP 1983, 164 p.

During the past decade environmental matters have received prominence in world affairs very largely arising from the negative impact of scientific, technological and economic practices on the environment. In the early seventies public awareness and consciousness on environmental issues gave birth to vigorous pressure from environmental movement groups around the world, prompting the United Nations to decide to set up a specialised agency called the United Nations Environment Programme (UNEP) to act as the UN's environment conscience. Its task was to monitor environmental matters and catalyse the global community to undertake appropriate, protective and remedial measures against escalating environmental degradation.

Set against this background, *Earth Matters* is a collection of articles, interviews and speeches by Dr. Mostafa K. Tolba, Executive Director of UNEP, examining major environmental issues facing the global community today. It contains statements made during 1982 preparatory to a Session of a Special Character of UNEP's Governing Council to commemorate the Stockholm Conference of 1972. The central message which permeates the ensemble is that the catastrophic consequences of resource destruction "can be reversed by us the authors, the people, through the use of industrial growth, science, technology, the international and national decision making mechanism". The statements in the book can be considered a stock-taking exercise. Taking 1982 as the nodal point, the text reviews and

examines in retrospect the state of the environment to date and lays the background for the assessment of the "environmental challenges for the 1980's".

The book is divided into two parts, the first consisting of speeches and the second being interviews and articles published in various media. It opens with an illuminating speech of a theoretical nature, in which the interdependence between *environment* and *development* is explained. The speech, delivered before the Japan Advisory Committee to Study Global Environmental programmes, in Tokyo in January 1982, eloquently elucidates the now widely used terms such as "ecodevelopment", "sustainable development" and "environmentally sound development", which frequently are not well understood by decision makers.

Public awareness about contemporary environmental matters has probably been one of the major achievements of the environmental movement over the past decade. However, while recognizing the commendable achievements so far in this aspect, the Executive Director calls for yet more vigour in the public information campaign, to inform the various global communities about the plight of our planet. Among the "publics" which need this education and information are politicians, businessmen and decision makers. Dr. Tolba has made the appeal for environmental responsibility in speeches and articles, like "Action or Disaster", "Defeating Complacency", "Highways to Nowhere", "The ecological fifth column", and interviews which include themes on "Mobilizing public concern", "Tourism: A great evil at a great good", "The high cost of not stopping desertification", "I pity the people", all of which were addressed to various audiences in Africa, Asia, Latin America, Europe and United States of America.

Earth Matters not only discusses environmental concerns, but also amply demonstrates that the earth DOES matter, and therefore needs our protection and delicate handling if it is going to continue serving our needs. By using language free of technical jargon Dr. Tolba succeeds in making pertinent statements about the condition of the environment, the actions needed for its sustenance and improvement, and the consequence for mankind of delayed remedial and protective measures. The contents have added value because of their short, informal and varied character, which should make the book easy and interesting to read by the wide array of decision makers including lawyers, economists, bankers, businessmen, politicians and planners for whom it is highly recommended reading.

Whether the global community will decode the intended message is another matter altogether — but the warning comes out loud and clear: *Nations have two choices: to carry on as they are and face by the turn of the century an environmental catastrophe which will witness devastation as complete and irreversible as any nuclear holocaust . . . or to begin now in earnest a co-operative effort to use rationally and fairly the world's resources*".

L.N.L.
S.S.S.

Campos-Lopés and Robert Andersen (Editors)

Natural Resources and Development in Arid Regions

Bowker Publishing Company 1983, 364 p.

The volume consists of conference papers on "Renewable Resources and Regional Development: The Case of Semi-Arid Zones". The conference took place in October 1980 in Cocoyoc, Mexico. It attempted to integrate various perspectives of resource management. The subject matter is divided into four parts: (a) Arid Climates; (b) Resource Assessment; (c) Development Options and (d) Assessing Technology and Interdisciplinary Research. To cover this very diverse and wide area, a total of 21 papers are presented. The material does not provide a "breakthrough" or a new paradigm in environment or arid-land studies, but brings together a comprehensive view of aspects relevant to the management of renewable resources.

Most of the materials presented in Part I are particular to Mexico, except for Chapter 1 which reviews the debate on classification of arid areas. The collection does not therefore cover, nor is it representative in global terms of, the world's arid regions. This, however, should not be the approach to the assessment of this book. Localized and specific research of the type found in this book should be commended, since it contributes to the understanding of the peculiarities of the arid zone under study so that policy formulation can be contextualized.

The chapters and the subject matter in Part II on Resource Assessment and in Part III on Development Options illuminate this point. Part II opens with an excellent chapter on soils of semi-arid regions, their types, the various land use practices and

the benefits resulting from different types of management. This is followed by several chapters on remote sensing to detect desertification, techniques for vegetation mapping in semi-arid regions, and computer enhancement of Landsat data for mapping renewable resources in arid regions, with a discussion of application of these techniques to area-study and their capacity to elicit detailed information, which can facilitate informed policy information. The utility of such detailed information becomes more evident in Part III, on Development Options, where it is demonstrated how knowledge of the species and environmental characteristics of an area can be manipulated to the benefit of the local inhabitants. Specifically, this part contains chapters on various options for development of arid and semi-arid regions. It covers small-scale mining, use of renewable energy sources, crop alternatives, botano-chemicals and solar energy. The chapters dealing with "Strategies for the Prevention of and Fight Against Desertification" and "The Adverse Effects of Economic Development on Agriculture and Distribution of Wealth in the Tropics" provide excellent and fruitful reading.

Since about World War II, western development experts have presented the third world with an assortment of innovations in a bid to alleviate it from the miseries occurring from calamities such as desertification. Cases abound, to the surprise of the "extension agents", of well pre-packaged innovation kits which continued to be shunned by the targeted recipients. All along, the message of this type of failure of otherwise well-formulated projects has been the need for contextualising whatever innovation is intended for a given people. No amount of planning for human society can be successful and beneficial if the social conditions of its application are over looked.

The above experience logically led to the inclusion in this text of Part IV on "Assessing Technologies and Interdisciplinary Research". The contents particularly emphasise one point; planning must be contextualized, as the resulting projects are not implemented in a vacuum. Without social assessment, the side-effects of planning for human society can be more costly than the intended benefits.

Many readers will find the chapters on the application of solar energy to social development particularly challenging, as they demonstrate that arid regions have valuable resources which, if exploited, would mean that the welfare of people in arid regions would be comparable to that of others in ecologically better-endowed environments. The essential services and facilities which are the domain of the urban elite can easily be extended to rural people in arid areas, improving their welfare in a manner so far unknown in most countries.

Overall, this text is valuable for practitioners and planners in the field of arid zones. Its value lies, among others, in the dissemination of information on how the problems of arid lands are being handled in some countries and affected regions. It is a book one can recommend strongly, as it contains work of knowledgeable authors who have been involved in the field for a while and have contributed substantially to the current global and regional understanding of arid land ecology and problems. Well-documented references at the end of each chapter provide interested readers with guidance to further reading and literature in specific topics.

G.K.

Foley, G. and Barnard, G.

Farm and Community Forestry

Earthscan, Energy Information Programme, Technical Report No. 3, 1984, 236 p.

Over the past decade, the need to take forestry outside the forests and involve local people in tree growing has been widely recognized. Projects to encourage farm and community forestry have been launched in over 50 developing countries. This report describes the main approaches which have been taken, and discusses their scope and limitations. It examines why people plant trees and the constraints which can prevent them from doing so. It analyses supply and demand systems for wood, and the underlying forces causing deforestation. Key aspects of programme design and implementation are also covered, including discussions of the problems associated with technical packages, the role of extension services and programme planning requirements.

A review of selected country programmes is also presented which summarizes the experiences gained in various parts of the world such as China, Korea, India, Malawi, the Sahel, Tanzania, the Phillipines and Nepal. Although not completely positive, this review demonstrates that some projects have had a considerable degree of success, particularly when the local populations have been well integrated into the planning and implementation stages.

This volume should be required reading for governmental and international development bodies thinking of formulating afforestation programmes.

D.S.

J. Dan, R. Gerson, Hanna Koyumdjisky and D.H. Yaalon, (Eds.)

Aridic Soils of Israel: Properties, Genesis and Management

Division of Scientific Publications, The Volcani Centre, Bet Dagen, Israel, Special Publication No. 190, 1981, 353 p.

This book provides a broad, contemporary review of the soil landscapes, stratigraphies and climates in the various arid parts of Israel. As such it will serve as a longstanding reference work on the main properties and soil characteristics of the different pedological regions, and be of wide interest to students of aridic environments and soils.

The book was compiled for the participants attending the International Conference on Aridic Soils, held March-April 1981 in Jerusalem. The thirteen chapters contain articles on the general environmental setting in the southern part of Israel, soil formation processes in the arid lands, and several detailed discussions of the soils located in selected areas in the lower Jordan Valley, the southern coastal plain and in the Negev.

The main focus of the book is on the first two subjects in the sub-title, properties and genesis, but management is touched upon in some of the articles by way of example. Based on analyses of land potential certain areas which have no agricultural potential, for example the Judean Desert, have been set aside as national parks and reserves. Other areas which have viable soils but lack moisture are earmarked for irrigation development projects. It is through a detailed description and analysis of soils that management plans can be developed.

D.S.

N. Petit-Maire and J. Riser, (Eds.)

Sahara ou Sahel? Quaternaire récent du Bassin de Taoudenni (Mali)

Laboratoire de Geologie du Quaternaire, C.N.R.S., 1983, 473 p.

This large, impressive tome (written in French) reports on the results of five research trips undertaken between early 1980 and the end of 1982 to northern Mali by interdisciplinary teams of French scientists. They set out to study an east-west band in Mali located between 19 degrees and 24 degrees north, today part of the Sahara Desert. As had researchers before them, they found abundant evidence for a much richer environment and wetter climate in the past during the Holocene period, particularly between 9,500 and 4,500 years ago. They concluded that since once in the past the arid Sahara was essentially part of the Sahelian zone that there is hope that it will be again one day. This is, according to the authors, supposed to offer a ray of hope to the governments and people of the drought-stricken and desertified areas of the Sudano-Sahelian region. The authors assume that desertification is due almost entirely to changes in climatic regime and that the current environmental problems facing the Sudano-Sahelian region will end with the current supposed dry climatic oscillation.

The book, which is well illustrated with 59 photographic plates, 80 line drawings and several maps and stratigraphic sections, is the result of a team effort by about 25 specialists in the earth, biological and human science fields. It is arranged in five chapters dealing respectively with the present situation, geology and geomorphology, paleobotany, paleontology, and paleoanthropology and prehistory.

Chapter I presents a base line so to speak of the current geography, climate, vegetation, fauna and human features of the study area which is necessary in order to fully appreciate the extraordinary changes that have occurred during what is, geologically speaking, a very brief span of time.

Chapters II-IV deal with the physical evidence used in reconstructing past climates and environment and putting it all into a time frame. We see that this band of northern Mali, today a desolate expanse of sand, rock and craggy hills, once teemed with herds of antelope, elephant and giraffe which wandered across savanna grasslands dotted with acacia trees and shrubs. Streams fed large lakes in which lived crocodiles, hippo and fish.

In chapter V we see the remains of the people who inhabited this land and who made a living hunting, fishing and gathering wild grains, which they converted into flour using grinding stones and mortar and pestles. There is no attempt made by the authors to reconstruct how man interacted with the ecology, however, and he rests an unknown quantity in the changing environmental picture.

The book presents a good schema of changing climate, land and biological diversity over a 5,000 year period in the Malian Sahara, but the authors show a lack of understanding of the processes involved in desertification and in its lasting qualities. A simple change in rainfall patterns tomorrow towards wetter conditions will not transform the Sahara into a Garden of Eden. For example, parts of the Ethiopian Highlands receive 1000 mm of rain a year today, up to ten times more than in northern Mali, yet soil erosion and desertification is progressing at an alarming pace.

It is caused by man's misuse of the land, deforestation, overgrazing, cultivating on steep slopes without terracing, etc. Once the soil is gone plant productivity becomes very low. Much of the soil which once existed in the Sahara is now lying at the bottom of the Atlantic Ocean, and increased rainfall will not bring it back within a reasonable - to man - period of time. Many think that the creation of the Sahara itself was not a result of decreased rainfall alone, but that man and his livestock played an important role then as they do now. It is now time to orient research towards elucidating man's role in the environmental changes of the past.

D.S.



Was the Sahara Desert a result of climatic change alone, or did man have a role to play as well? (Earthscan/Anthony Howarth)

QUESTIONNAIRE

The editors of *Desertification Control* would like to find out more about their readers, what they think of the bulletin, and any suggestions that they might have on how to improve it. Readers should understand, of course, that we are limited as to the articles that we can publish by way of what we receive in unsolicited manuscripts. The editors would like to receive more manuscripts, thus if any of you have something interesting or of value to report on desertification control activities, please send it in. We would particularly like to receive short news items to publish in our News section.

To help us learn about your needs and desires for information on desertification processes and control, please respond to the following questionnaire:

1. (a) Are the types of articles published helpful to you in your work or research:
Yes No If no why?
.....
(b) What do you do?

2. What kind of articles do you like most?
..... Research in desertification control
..... Reports on national or regional activities in the combat against desertification
..... Reports on UNEP's projects in desertification control

3. Which articles in past issues have you found the most interesting? Please indicate title.

4. What subjects would you like to see covered in the future?

5. Are there any specific areas you would like to see included in the News Section?

6. Are there any new sections you would like to see in the bulletin?

7. Would you prefer to read the bulletin in French or Spanish?
French Spanish Other

8. If we could not publish the bulletin any more unless our readers supported us financially, would you consider a subscription in order to help keep the *Desertification Control Bulletin* alive? If yes, how much could you contribute annually?

9. Submit three names and addresses of individuals or institutions involved in desertification control who may be interested in receiving future copies of the bulletin.

10. My area of specialization is
Return to: Desertification Branch,
P.O. Box 30552
Nairobi
Kenya

**Photographs for
Desertification Control Bulletin
Covers**

The Editor of *Desertification Control Bulletin* is seeking photographs for consideration as bulletin covers. All submissions should be addressed to:

The Editor
Desertification Control Bulletin
UNEP
P.O. Box 30552
Nairobi
Kenya

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 an A4 format.

Captions

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

Copyright

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

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.

Desertification Control Bulletin is an international bulletin published at six-monthly intervals by the United Nations Environment Programme (UNEP) to disseminate information and knowledge on desertification

problems and to present news on the programmes, activities and achievements in the implementation of the Plan of Action to Combat 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 the 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 corner.

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 of reference in the text. Only essential tables should be included and all should be identified as to source.

Illustrations

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 x 24 cm (8 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 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, while articles longer than 4,500 words are not accepted.

A reasonable fee is paid for articles accepted for publication, and 25 reprints are provided to the authors.

