UNITED NATIONS CONFERENCE ON DESERTIFICATION

29 August - 9 September 1977

ROUND-UP, PLAN OF ACTION AND RESOLUTIONS

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A. ROUND-UP OF THE CONFERENCE

The winter rains had not ended in Kenya by the end of August when the United Nations Conference on Desertification met in Nairobi. Over the high tower of the Kenyatta Conference Centre the skies were grey and occasional showers sent people scurrying for cover along the puddled streets. Uhuru Park glistened in the rain and the Jacaranda trees dripped in the gentle sun afterwards. Altogether, Nairobi seemed far removed from the problems before the desertification conference.

In fact the world as a whole seemed rather removed from the mood and dangers of the early seventies. In 1973 the Sahelian region of Africa, the southern margin of the Sahara, had seen five years of uninterrupted drought. Lake Chad had shrunk to a third of its normal size, the Niger and Senegal rivers had not flooded, leaving barren much of the best agricultural land of the area. Shallow and seasonal wells dried up. Vegetation disappeared as hungry animals stripped the land. Patches of newly created desert seemed to grow and link with the great desert to the north. As people fled the stricken area in large numbers the world was faced with a series of unanswered questions.

Was the Sahelian drought evidence of larger changes in the global climate? Was the Sahara expanding south? What implications did this have for the countries directly involved? For their neighbours? For the international community? Most important, what could be done to cushion the impact of, or prevent disastrous changes? It was in the absence of answers to such questions that the U.N. General Assembly called for a world conference on desertification. But in the year the Assembly acted, the rains returned to the Sahel. The years since then have seen the slow but steady regeneration of the area and no disasters of similar magnitude have occurred elsewhere.

However, even without the spur of present disaster, some 500 delegates from 94 countries gathered in Nairobi from 29 August to 9 September to discuss the problems of desertification. The reasons are evident in the documents prepared for the conference, for they show that the problems of desertification are larger, more widely shared, and require greater and longer term action than expected. The simplistic fears of a few years ago are now replaced by a well-founded sense of danger. And it is amply clear that

preventing the degradation of land and reclaiming desertified land are not only highly profitable propositions, but essential for economic and social developments as well.

Before looking at some of the findings in the conference documentation, however, it would be useful to consider briefly the process by which the documents were prepared. The General Assembly resolution that called for the conference [Res. 3337 (XXIX)] delegated the responsibility of preparing for the meeting to the Executive Director of the United Nations Environment Programme, with UNEP's 58-member Governing Council serving as the intergovernmental authority in charge. To ensure, as the Assembly resolution directed, that "all available knowledge in this area is fully utilized", UNEP Executive Director, Mr. Mostafa Kamal Tolba, drew extensively on the resources of the world scientific community. Four scholarly reviews were commissioned that looked at the relationship of desertification to climate, ecological change, technology and society. Underpinning these reviews were a further set of studies, funded by the U.N. Development Programme, that looked not at the global scene but at the actual processes of desertification in a number of countries. They analysed the processes in different ecological and socio-economic circumstances, and looked at the efficacy of remedial action. Yet another group of scientists looked at the feasibility of transnational attempts to fight desertification. Other scientists within and outside the U.N. system prepared world and regional desertification maps. Based on all this an Overview was prepared, which served as the main document for conference delegates.

What has emerged from all this expert work is a fascinating picture of the fluid relationships that exist between humanity and the biosphere. What has also become clear is that desertification is not a problem that concerns just a few countries. Based on climatic data, more than a third of the earth's surface is desert or semi-desert and more than 15 per cent of the world's population live in these areas. If we go by data on the nature of soil and vegetation, the total area is some 43 per cent of the earth's land surface. The difference is accounted for by the estimated extent of man-made deserts (9,115,000 square kilometres), an area larger than Brazil.

Further, some 30 million square kilometres (19 per cent of the earth's land surface) are threatened with desertification, and this threatened area is distributed among more than two-thirds of the world's 150 countries.

Estimates of present losses of productive land suggest that the world will lose close to one third of its arable land by the end of the century. Such a loss during a period of unprecedented population growth and increased demands for food could be disastrous. To assess the cost of preventing this degradation of land a group of experts were convened by the Conference secretariat. They estimated that the costs of corrective measures would be far outweighed by the benefit in strictly financial terms. The many social benefits that would result from a programme to save and reclaim land cannot, of course, be assessed in terms of money.

The process of desertification

To see precisely what happens when desertification occurs, attention should be focused on that shallow meeting place between soil and atmosphere, where plants thrive and where a balance is maintained between incoming and outgoing energy and between water received and lost.

When rain falls, some of the water is taken up directly by plants, some filters into the soil, where it may remain in storage, and the rest evaporates or runs off. Some soil moisture, that intercepted by plants, is put back into the atmosphere by the plants in transpiration. Some of the moisture may seep into deeper layers to collect in underground reservoirs or aquifers, where it may remain for thousands of years, or many migrate slowly from plateau to depression or back to the ocean itself.

The soil-air meeting place participates in an energy balance activated by the rays of the sun or through atmospheric heating. Some energy is reflected by the surface layer back into the atmosphere and into space. Some is held by the soil in storage, thereby warming the earth, and it is this energy and that from the sun directly that is used by plants to carry out the processes of photosynthesis and growth. Some of the plants are eaten by grazers or browsers, and these animals in turn may be eaten by carnivores, with all animals returning energy and moisture to the atmosphere in respiration and to the soil in the form of humus. The excreta of animals, their decomposing carcasses and the decomposition of plants supply the soil with nutrients, most densely in the topmost layers and thinning out below.

In arid situations the cycling of water and energy takes on special characteristics because of deficient and variable rainfall and abundant solar energy from cloudless skies. Vegetation is generally sparser than in humid areas, provides less cover to the ground surface and returns less organic matter to the topsoil. During occasional intense rainfall, runoff may occur in space, but water at the surface tends rapidly to be lost through evaporation, and in the long intervening dry spells the soil is parched and heated by the powerful sun.

However scanty it may be, the dryland vegetation constitutes a fundamental resource which transforms solar energy into food and which protects and stabilizes the surface of the ground. This vegetation survives by adapting to water deficit in ways which are important because they determine seasonal differences in the usefulness of dryland pastures.

Man upsets the natural balance

Under natural conditions and through appropriate strategies, the dryland ecosystems maintain a balanced exchange of water and energy, but a favourable equilibrium is readily disturbed when man makes use of the land. For example, where meagre vegetation is further reduced to expose the ground surface, humus will be mineralized and soil structure lost. Rain will fall directly on the soil, and break it down, and the sun will bake a thin crust which prevents additional water from sinking in. As the water budget deteriorates in the soil beneath, the level of groundwater in nearby wells may fall. The water lost to the soil store now contributes to over-rapid runoff. Where the surface has been loosened or disturbed as by the trampling of animals, the topmost soil layer, that with the best structure and containing the bulk of plant food, may be washed away, or blown away in dust storms. The denuded soil is essentially infertile, with poor structure and water relations. All these changes constitute a shift towards a more hostile environment for plants, with the result that the vegetation responds less well to rain and produces less biomass, and many plants tend to die off at an increasingly early stage of drought. Such changes are typical of desertification.

Rain-fed farming

In areas of rain-fed farming, desertification often originates on land cleared for cultivation or left fallow. Removal of the original vegetative cover exposes the soil to accelerated wind and water erosion. The beating action of rain on naked soil puddles the surface which crusts when the sun comes out, reducing infiltration and further increasing runoff. This, in turn, leads to increased soil erosion which ultimately, unless halted by protective measures, strips away the fertile surface soil and exposes infertile subsoils. Gullies may form on the lower parts of slopes and impede farming operations, or prevent them entirely. Sediment deposited at the foot of slopes covers plans, fills waterways and aggravates flooding in low-lying areas which follows increased run-off from the slopes above.

Water and wind erosion

Water and wind erosion work together, as redeposited silts from surfaces stripped by water erosion are particularly vulnerable to wind transport. Wirid erosion starts with the movement of coarse soil particles in one part of a field, then progresses downwind with increasing severity as bouncing soil particles knock other particles into the air in a kind of snowballing effect. Finer materials are lifted into the air and carried away over long distances as dust; coarser sandy materials drift over the surface until they are trapped by plants in accumulations as hummocks and small dunes. Removal of fine topsoil materials means the loss of the most productive and nutritious portions of the soil complex, while sterile sand accumulations cover plants and good soil. A further harmful effect of high-velocity sand drift is the destruction of young crops by the blasting impact of moving sand. Fine airborne particles may carry soil-borne diseases, irritate respiratory tracts of humans and animals, cause wear on machinery parts and reduce visibility.

Irrigated land

The principal manifestations of desertification on irrigated lands are the salinization and alkalinization of soils, due to inadequate leaching of salts contained in the soil or added in irrigation water. Salinization and waterlogging commonly occur together. Where the soil is waterlogged, the upward movement of saline groundwater leaves salts on the surface where water evaporates. On soils that are not waterlogged, salinization can still occur when water containing soluble salts moves from irrigation furrows into the ridges where crops are planted or to high spots in poorly levelled land. Under-irrigation of weakly permeable soils can also lead to salinization if the irrigation water is salty.

When left alone, dryland ecosystems disturbed by land uses or stressed by drought, will usually return to what they were. Recovery tends to advance at a slow pace because of the low productivity of drylands and is usually episodic, with more rapid recovery in years of above-average rainfall. Eventually, former water and energy balances will be restored, with the recovery of the original vegetation. This is a measure of the natural resilience of the drylands .

Factors initiating desertification

Where pressure of land use persists through drought, these same ecosystems are shown to be fragile, and processes can be set in motion whereby desertification becomes self-accelerating. This can occur where sand dunes are stripped of vegetation, as near watering points or other places where stock tend to congregate, and drifting sand destroys more vegetation and mobilizes extending surfaces, and dunes slowly advance and engulf less damaged sites. It can occur where destruction of vegetation initiates accelerating erosion, removing sediment which, in turn, buries fields or pastures downstream, or in denuded areas, where hot, drying winds become increasingly prevalent. In irrigated systems, lack of drainage allows water tables to rise and waterlog and salinize fields to the point where they must be abandoned. Because self-acceleration can occur through a variety of circumstances, desertification will often advance inexorably unless preventive measures are undertaken. As it advances, it becomes ever more difficult and more expensive to treat, with the costs of reclamation continually rising until the stark equilibrium of extreme desert is reached and the land has for all practical purposes passed beyond hope of rehabilitation.

Deserts themselves are not the sources from which desertification springs. Except for hot winds, the deserts themselves supply none of the essential impetus for the processes described. Desertification breaks out, usually at times of drought stress, in areas of naturally vulnerable land subject to pressures of land use. These degraded patches, like a skin disease, link up to carry the process over extended areas. It is generally incorrect to envision the process as an advance of the desert frontier engulfing usable land on its perimeter: the advancing sand dune is in fact a very special and localized case. Desertification, as a patchy destruction that may be far removed from any nebulous front line, is a more subtle and

insidious process.

Measures to combat desertification

During its two week session the Desertification Conference spent most of its time considering a Plan of Action. A draft plan had been prepared by the secretariat, in consultation with an international group of experts and with the help of governments at four regional meetings as well as at meetings of the UNEP Governing Council. The Conference considered the draft paragraph by paragraph, strengthening, reshaping and moulding it according to the needs of governments. What resulted is a document of 104 paragraphs, containing 28 recommendations for action.

If there is one central theme to the plan, it is that action must not await complete knowledge about complex situations. The need is recognized for immediate action in applying existing knowledge, not only to stop the physical processes of desertification, but to educate people in minimizing the harm done to the fragile ecosystems of drylands by existing economic and social activities. The plan acknowledges the need to base improved systems of landuse on the inevitability of periodic drought. And it acknowledges also that drylands have a low level of natural biological productivity.

Another central theme of the plan is that all measures are to be directed primarily toward the well-being and development of the peoples affected by or vulnerable to desertification. Efforts to fight desertification must thus be consistent with and part of wider development programmes. In implementing programmes the plan stresses the cultural and ecological variety in vulnerable areas and the overriding need for an approach that is both sensitive and flexble.

While underlining the need for urgent short-term relief measures, the plan recognizes that long-term programmes to prevent desertification should not be delayed because the cost of prevention is far less than that of the cure.

B. PLAN OF ACTION TO COMBAT DESERTIFICATION

I. Introduction

1. The present Plan of Action to Combat Desertification was presented to the United Nations Conference on Desertification in response to General Assembly resolution 3337 (XXIX) of 17 December 1974 on international co-operation to combat desertification.

2. In August 1976 and January 1977, a preliminary draft and a second preliminary draft were circulated for comments to Governments, members of the United Nations system, intergovernmental organizations, research institutions and other bodies, and the panel of senior consultants appointed by the Secretary-General of the Conference. The second preliminary draft was considered by the four regional preparatory meetings for the Conference, as well as at the fifth session of the Governing Council of the United Nations Environment Programme, acting in its capacity as the intergovernmental preparatory body for the Conference.

3. The present text takes account of the Mar del Plata Plan of Action of the United Nations Water Conference, and of the discussions during the twenty-second session of the Advisory Committee on the Application of Science and Technology to Development. The Plan reflects fully the findings and recommendations of the component reviews and the overview of the causes and processes of desertification (A/CONF.74/1), the case studies (A/CONF.74/4), the feasibility studies (A/CONF. 74/3/Add.1) as well as other preparatory material for the Conference, and takes full account of the

discussion at the regional preparatory meetings and at the fifth session of the Governing Council of UNEP.

II. Origin and scope of the Plan

4. More than one third of the earth's land area is arid. Much of it has become desert since the dawn of civilization, and many vulnerable areas are even now being turned into desert. This process has intensified in recent decades, and threatens the future of 628 million people, or that 14 per cent of the world's population who live in the drylands; of this number, between 50 and 78 million people are affected directly by decreases in productivity associated with current desertification processes. In the past half century, on the southern edge of the Sahara alone, as much as 650,000 square kilometres of once productive land has become desert. Drought represents a recurrent menace in various parts of the world. The Sahelian drought of 1968-1973 and its tragic effect on the peoples of that region drew world attention to the chronic problems of human survival and development on the desert margins.

5. In conformity with the Charter of the United Nations, a number of resolutions by the United Nations General Assembly have addressed these problems. The first All-African Seminar on the Human Environment, convened in August 1971 under the auspices of the Economic Commission for Africa (ECA), made specific recommendations for steps to be taken to combat the spread of deserts in Africa. At the third session of the ECA Conference of Ministers, resolution 264 (XII) on desertification drew attention to this menace and urged that ECA take steps in collaboration with the international community to seek solutions to the problems. General Assembly resolution 3202 (S-VI) of 1 May 1974 recommended that the international community undertake concrete and speedy measures to arrest desertification and assist the economic development of affected areas. Economic and Social Council resolution 1878 (LVII) of 16 July 1974 requested all the concerned organizations of the United Nations system to pursue a broad attack on the drought problem. Decisions of the Governing Councils of the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP) emphasized the need to undertake studies of the extent of drought, and to draw up appropriate action programmes to check the spread of desert conditions.

6. The General Assembly then decided, by resolution 3337 (XXIX) of 17 December 1974, to initiate concerted international action to combat the spread of desert conditions. To give impetus to international action, the General Assembly decided to convene a United Nations Conference on Desertification, between 29 August and 9 September 1977, which would produce an effective, comprehensive and co-ordinated Plan of Action to Combat Desertification.

7. Desertification is the diminution or destruction of the biological potential of the land, and can lead ultimately to desert-like conditions. It is an aspect of the widespread deterioration of ecosystems, and has diminished or destroyed the biological potential, i.e. plant and animal production, for multiple use purposes at a time when increased productivity is needed to support growing populations in quest of development. Important factors in contemporary society--the struggle for development and the effort to increase food production, and to adapt and apply modern technologies, set against a background of population growth and demographic change--interlock in a network of cause and effect. Progress in development, planned population growth and improvements in all types of biological production and relevant technologies must therefore be integrated. The deterioration of productive ecosystems is an obvious and serious threat to human progress. In general, the quest for ever greater productivity has intensified exploitation and has carried disturbance by man into less productive and more fragile lands. Overexploitation gives rise to degradation of vegetation, soil and water, the three elements which serve as the natural foundation for human existence. In exceptionally fragile ecosystems, such as those on the desert margins, the loss of biological productivity through the degradation of plant, animal, soil and water resources can easily become irreversible, and permanently reduce their capacity to support human

life. Desertification is a self-accelerating process, feeding on itself, and as it advances, rehabilitation costs rise exponentially. Action to combat desertification is required urgently before the costs of rehabilitation rise beyond practical possibility or before the opportunity to act is lost forever.

8. In preparing for the Conference, attention was focused on tropical, subtropical and temperate drylands. The Plan of Action covers areas where desertification is occurring now and others which are vulnerable to future desertification, including arid, semi-arid and sub-humid areas. It is important to note that the irrational use of the complex ecosystems of the humid tropics carries the risk of diminishing their biological productivity, which in turn could have harmful consequences for neighbouring semi-arid and arid zones. The distribution and relative intensity of desertification problems are shown on the Desertification Map of the World (A/CONF.74/2).

9. The Plan of Action presents a set of recommendations for initiating and sustaining a co-operative effort on the scale required to combat desertification. This co-operative effort should reinforce and integrate national, regional and global international actions against desertification that are currently going on both inside and outside the United Nations family. A review of current United Nations programmes which have an impact on certain aspects of the desertification problem may be found in the report of the Environment Co-ordination Board (A/CONF.74/32) prepared on the occasion of the Conference. Although these programmes, as well as numerous national programmes, are directly or indirectly concerned with combating desertification, there is a compelling need to focus and co-ordinate these activities and support the creation of new national, regional and global programmes, all as part of an international co-operative effort to combat desertification. The goal is to implement the Plan of Action by the year 2000. The seven-year period 1978-1984 has been chosen for the implementation of the immediate actions required and as an indication of the time at which a first general assessment of progress could be made.

III. Objectives and principles

10. The immediate goal of the Plan of Action to Combat Desertification is to prevent and to arrest the advance of desertification and, where possible, to reclaim desertified land for productive use. The ultimate objective is to sustain and promote, within ecological limits, the productivity of arid, semi-arid, sub-humid and other areas vulnerable to desertification in order to improve the quality of life of their inhabitants. A campaign against desertification should take its place as a priority among efforts to achieve optimum and sustained productivity. For the countries affected, the implementation of this Plan of Action implies more than a campaign against desertification; it is an essential part of the broad process of development and the provision of basic human needs.

11. Desertification is not a problem susceptible to quick solutions, but it is already urgent in many areas. It calls for continuous assessment and longterm planning and management at all levels, supported by international co-operation. Such programmes, even when long-term, should be started without delay. In many cases, technical solutions are available now, but their application can be impeded by social, legal and sometimes institutional factors, However, in developing countries the lack of financial resources constitutes one of the greatest obstacles to this application.

12. Given the interdependence of the development process, population change, relevant technologies and biological productivity, it follows that the effects of desertification on productive ecosystems can best be ameliorated if action takes into account all these elements. In other words, efforts to combat desertification must be part of a broad programme for promoting social and economic progress. The United Nations has expressed a common aspiration to improve the quality of life and to provide the basic human needs for all people, especially in developing countries. This aspiration manifests itself in the Charter of the United Nations and in international declarations, decisions and recommendations,

particularly of the past decade, especially in the Declaration on the Establishment of a New International Economic Order and the related Programme of Action on the Charter of Economic Rights and Duties of States, in the International Development Strategy for the Second United Nations Development Decade, in the Declaration on the Human Environment and in the action plans of the United Nations Conferences on Science and Technology, the Human Environment, Population, Food, Women, Trade and Development, Human Settlements, and Water. These represent steps taken by the international community to formulate essential programmes for development in its broadest sense. To be successful, the effort to combat desertification must be seen as an integral element in this larger effort of social and economic advancement.

13. Desertification commonly appears as the deterioration of land, water and other natural resources under ecological stress. Deterioration implies that activities undertaken in an area have been unsuitable, either in degree or in kind. Such activities may have been pursued because of lack of environmental knowledge or experience, because alternatives were lacking, or in an attempt to maximize short-term gain at the expense of long-term productivity. While solutions probably rest ultimately in education, social and economic advancement and the adjustment of population growth to the development of resources, the proximate solution centres on improved land use. This involves three elements: (*a*) an inventory of local resources and an assessment of their capabilities and potential; (*b*) a determination of which uses are desirable in terms of resource capabilities and socio-economic goals and constraints; and (*c*) a system for implementing the resulting plan for the optimum use, reclamation and protection of natural resources.

14. While water, soil and other material and biological resources are often the limiting physical factors, social, political and other human systems for making decisions and implementing plans, and the inadequate availability of financial resources, may constitute the major constraints to development, prevention of desertification, and rehabilitation of desertified lands. Social and economic problems in resource management are a principal concern of this Plan of Action to Combat Desertification. As the management of natural resources is a critical component of any strategy for physical, social, or economic development, the adoption of improved policies for the management of natural resources is essential to all ecosystems if their productivity is to be developed and maintained. The recommendations for assessment and management of natural resources in this Plan of Action are generally applicable, but in the context of the Plan, they focus on areas vulnerable to desertification and on those desertified areas that promise a degree of recovery.

15. The causes of desertification vary among the affected regions of the world owing to differences in their ecological characteristics and their social and economic structures and aspirations. Each region may require a distinctive approach to desertification problems. With natural resource management as its primary concern, this Plan of Action recommends methods for setting priorities for action against desertification, but it leaves the actual determination of priorities to national policies and plans. There are, however, desertification problems which cross national boundaries, and the Plan of Action aims at strengthening regional and international capabilities to deal with such transnational problems and to provide effective international co-operation when requested.

16. The basic principles guiding the present Plan of Action are:

(*a*) All action shall be consistent with the provisions of the Charter of the United Nations;

(*b*) A central theme will be the immediate adaptation and application of existing knowledge, particularly in the implementation of urgent corrective measures against desertification, in educating the people and the affected communities to an awareness of the problem, and instituting training programmes in collaboration with international Organizations such as

the Permanent Inter-State Committee on Drought Control in the Sahel, the United Nations Educational, Scientific and Cultural Organization (UNESCO), through its Man and the Biosphere (MAB) Programme, the Food and Agriculture Organization of the United Nations, through its programme on Ecological Management of Arid and Semi-Arid Rangelands (EMASAR);

(*c*) Improved land use, calling for assessment, planning and sound management on the basis of the application of known ecological principles to areas subject to desertification, is a key to success in combating desertification;

(*d*) Improved land use should recognize the inevitability of periodic climatic drought in dry lands and their generally low natural biological potential;

(*e*) Integrated land-use measures should be directed at the restoration of vegetation cover on marginal land, making particular use of adapted species of plants and animals;

(*f*) When the restoration of vegetation requires the relaxation of human pressures, temporary compensatory measures should be taken to provide alternative supplies of food and fuel;

(*g*) The Plan is to be carried out as an effective, comprehensive and co-ordinated action programme against desertification, including the building up of local and national scientific, technological and administrative facilities in the areas concerned;

(*h*) All measures are to be primarily directed toward the well-being and development of the peoples affected by, or vulnerable to, desertification;

(*i*) Efforts should be consistent with, and form part of, wider programmes for development and social progress;

(*j*) Implementation is based on the recognition of socio-economic, cultural and ecological variety in the vulnerable areas, and the overriding need for a positive and flexible response;

(*k*) Additional research to clarify a number of fundamental problems for the solution of which the requisite scientific knowledge is not yet available, should be consistent with strengthening the scientific and technological capability of the affected areas;

(*l*) Traditional use as food, fuel or other products of wild species of plants and animals which often do not appear in the national marketing statistics should be regarded as an important resource and fully investigated;

(*m*) Implementation calls for the pooling of the resources of the United Nations system in launching the Plan and carrying out an integrated and worldwide programme of development, research and application of science and technology to solve the special problems of desertification;

(*n*) Land and water management should take into account a number of ecological principles:

> (i) Lands need to be managed as ecological wholes (e.g. an entire watershed, the total of plant and animal communities, an area viewed as a complex of micro-topographies);

(ii) The use of drylands should be carefully timed to confirm with fluctuations in climatic conditions;

(iii) The use of land should be carefully allocated so as to give optimum sustained productivity; its use must be fitted to its capabilities;

(*o*) Particular attention should be given to the utilization of local experience, knowledge and expertise in the implementation of the recommendations of the Plan at the national level in the countries concerned;

(*p*) While populations currently affected by desertification urgently require short-term relief measures, long-term amelioration should not be delayed, since the cost of prevention is less than that of cure;

(*q*) Attention should be given to the assessment of secondary environmental problems which may be triggered by measures intended to remedy desertification, as well as the effects of development activities undertaken outside the affected areas;

(*r*) Attention should be paid to providing facilities and housing for people living in new conditions created by programmes which combat desertification;

(*s*) Attention should be paid to the judicious conservation and use of water resources in each region, including fair and equitable sharing of the waters of international rivers, lakes and underground aquifers, and inter-basin transfer of surplus water where this is environmentally sound and is necessary to prevent desertification.

(*t*) The productivity of all available renewable resources, including forest, wildlife and fisheries, should be optimized and managed on a sustainable yield basis.

17. The implementation of the Plan of Action to Combat Desertification is expected to be carried out by Governments through their national institutions, with the support, when requested, of international or bilateral programmes. It is recognized that the recommendations contained in the Plan may need to be adapted to suit the requirements of individual countries, and that those countries may wish to select such measures for implementation as are appropriate to their needs.

IV. Recommendations for national and regional action

18. The following set of recommendations is proposed for co-operative national and regional action to combat the vast problem of desertification, against which no single recommendation would alone be successful. An integrated complex of measures is the only way to prevent and arrest desertification, and to restore the productivity of areas already desertified. Integration means that all the recommendations are seen to be as linked in a multidimensional inter-relationship. Ideally, all the recommended actions should be implemented together, but unfortunately many countries do not have sufficient resources to do this. Hard choices must be made in the allocation of scarce resources to action programmes. National priorities should be established before financial and technical resources are committed to such programmes.

19. It is recognized that countries affected or likely to be affected by desertification are at different stages with respect to their appreciation of desertification problems and their ability to cope with them. Depending on the level of national awareness and on the kinds of action already taken, countries will

follow a certain sequence in their efforts to combat desertification, entering the campaign at an appropriate stage. The sequence of states might be as follows:

(*a*) First define the magnitude and impact of desertification by:

(i) Strengthening or establishing a national body for assessment and monitoring of desertification;

(ii) Determining the criteria for identifying and assessing desertification and its causes;

(iii) Assessing the problem on the basis of the criteria and techniques adopted, particularly to determine what land uses lead to desertification and where;

(*b*) If a significant problem does exist, then:

(i) Draw up and implement programmes as outlined in the Plan of Action to Combat Desertification;

(ii) Set up a system to monitor the problem;

(*c*) Where remedial programmes have already been started:

(i) Monitor the progress of the programmes and assess their usefulness;

(ii) Disseminate related information among the international community.

20. It would appear that the actual situation in the majority of areas affected by desertification has not been fully assessed. On the basis of the above-mentioned considerations, the proposals of the Plan of Action start with arrangements for assessment and planning, proceed to specific recommendations for improved land management, and conclude with supporting measures.

A. EVALUATION OF DESERTIFICATION AND IMPROVEMENT OF LAND MANAGEMENT

Recommendation 1

21. In undertaking action against desertification, countries need to assess and evaluate desertification in the local situation, its magnitude and extent, its causes and effects. It is necessary to know exactly what parts of the country are affected or vulnerable.

It is recommended that, where it is not yet done, desertification and the degradation processes leading to it be assessed and evaluated as they affect people, the physical elements of the environment (earth, water and air), and the plant and animal products of the land and water in territories experiencing or likely to experience it, using in the first instance existing data and carrying out new surveys whenever required, with the aim of defining priorities for national and local programmes and projects in those areas where population or resources are directly threatened. It is also recommended that, in the assessment of desertification, comparable indices should, whenever practicable, be applied in all regions exposed to the threat of desertification

22. A system of survey and monitoring should be established or strengthened to assemble information on resources and populations and to carry out monitoring of the dynamics of desertification, including the human condition. The assembly and evaluation of information should be a continuous process, providing a feedback mechanism for national planning and action. To carry this out, national action should be considered to establish machinery for assessing desertification in the following ways:

(*a*) To indicate the relative seriousness of the situation for all the regions affected, with a view to establishing priorities and degrees of urgency;

(*b*) To standardize monitoring facilities and methods in regions affected or likely to become so;

(*c*) To improve networks of climatological, meteorological and hydrological stations in regions exposed to desertification so as to permit more detailed and sustained monitoring and assessment of climatic and hydrological conditions in relation to the desertification process. In most regions of the world undergoing desertification, these networks are inadequate. They could be considerably improved individually or collectively by national climatological, meteorological and hydrological services, with the support of the competent agencies of the United Nations and other international bodies. In sparsely populated regions, where recruitment of the personnel needed for the stations may be difficult, automatic observation posts could be used. Satellite imagery techniques should be employed where appropriate. National meteorological and hydrological services should provide ongoing assessments of the situation on the basis of the data obtained;

(*d*) To monitor desertification by observing atmospheric processes, the state of vegetation and soil cover, dust transport, shifting of sand dunes, the distribution, migration and abundance of wildlife, the condition of livestock, the phenology of crops, crop yields, and changes in irrigated lands;

(*e*) To compile desertification maps and see that they are revised through periodic assessments using appropriate techniques which will be efficient at an acceptable cost.

23. The recommendation also implies regional actions, particularly through the United Nations regional commissions and intergovernmental regional organizations, such as:

(*a*) The implementation of the regional schemes suggested by studies on the feasibility of regional or transnational co-operation in the monitoring of desert processes and related natural resources, including the establishment of regional desertification monitoring centres for groups of countries that are particularly vulnerable to desertification and share ecological conditions, to assist in the co-ordination of national programmes and to organize the maximum use of expertise available in the region;

(*b*) The organization of a continuous system for the exchange of information gained from monitoring among countries of the region concerned.

Recommendation 2

24. The introduction of improved and effective land management in areas subject to desertification, or to degradation processes leading to it, involves a broad range of social, economic, institutional, legislative, and technical measures. Among various factors which might determine the proposed development, the

most important are: availability of water, land capability, climate, biological productivity, and other environmental constraints, reclamation requirements, population and its pressures, social and economic goals and constraints, cultural and behavioural patterns, health conditions, location and relationships with other areas. The wide diversity of social-economic structures and environmental conditions demands flexibility and suggests that blanket proposals are unsuitable. Each arid land area has established its own land-use practices on the basis of local conditions and aspirations, and these constitute the starting point for proposed changes. At the same time, some general principles of land-use planning and management, as well as of land-use surveys, might be recommended internationally on the basis of existing knowledge. Whereas the present Plan of Action is concerned primarily with areas affected or likely to be affected by desertification, changes in land-use management proposed for those areas should not accentuate any current risk of desertification and, where possible, should be consistent with broader national or regional development plans.

It is recommended that in areas affected or likely to be affected by desertification, land-use planning and management based on ecologically sound methods should be introduced in conformity with social equity and geared to fostering economic and social development.

25. To implement this recommendation, national action is required to:

(*a*) Strengthen national and local capabilities in land-use planning and management and direct them towards problems of desertification. Many nations have national or (in federal systems) state/provincial economic planning commissions. It follows that land-use planning and policies to combat desertification should be one of the major responsibilities of high-level planning groups concerned with national or state/provincial development. Where such a planning group does not exist, it should be established at a high level of government, with authority to formulate policy and plans and to guide the implementation of those plans. In carrying out such action, the following should receive consideration:

(i) Local-level planning and implementation should be encouraged. It is also important to take an integrated approach, with all the existing machinery and all the available talent in sectoral and central planning institutes being used in the planning process, and with special regard to the aspirations and values of the local people;

(ii) Though the planners' primary expertise should be in the theory and techniques of assessment, planning and management of human and natural resources, they should have access to expertise in law, economics, demography, sociology, urban planning, ecology, geography, geology, soil science, agricultural sciences, hydrology, hydrogeology, climatology, remote sensing, statistics, and cartography. Where such training is not locally available, arrangements should be made to train planners elsewhere until the required training is established locally;

(iii) The land-use planning group should be supported by a natural resource survey, including the preparation of all types of thematic maps for the inventory and assessment of land, water, plant and animal resources and preventive and monitoring programmes;

(iv) Action against desertification, however, should not await the formation of a unit composed of specialists in all pertinent fields of land-use planning;

(*b*) Survey natural resources and the human condition in areas affected or likely to be affected by desertification. To be realistic, land-use plans must be based on accurate data. To provide control for data collection, the social and environmental objectives for an area must be precisely defined, thus producing a frame of reference for the survey work. The first task of a land-use planning group and its associated survey programme is to assemble and analyse available information. The survey should then be designed to fill gaps in existing information and to update it through continuous surveying or monitoring. A land-use plan must be flexible enough to accommodate changes in the area covered, as revealed by monitoring;

(*c*) Formulate a land-use plan for an area to be managed effectively within the resources immediately available. This can serve as a pilot area for testing plans and research results, training managers and correcting planning errors. Out of this will arise a comprehensive land-use plan embracing a broad area. At the heart of land-use policy is the difficult determination of what people can realistically hope to achieve with the resources at their disposal. Once a relatively complete inventory of natural resources and the human condition is available, the land-use planning group will identify the management options for each section of the area within its purview. Management options concern the types and intensity of use which are physically and biologically appropriate to the resources of the section, and the codification of the goals and constraints in relation to land-use policy. A comprehensive land-use plan would assign all sections of the area to particular uses, such as crops, livestock, game ranching, forests, biosphere reserves, recreation, mining, industry, roads, urbanization, housing and other uses. The following considerations must be borne in mind:

(i) Initially at least, land-use planning may be imprecise, given the size of the areas concerned and the absence of previous plans and limitations in financial and technical support. These rough preliminary plans can be elaborated and specified later as survey and monitoring proceed;

(ii) Evaluations and revisions of the landuse plans at appropriate intervals are essential. Their implementation should allow for continuing evaluation of the real impact of the project socially, economically and environmentally, and authorities should be prepared to modify land-use plans to correct mistakes and accommodate new technology;

(iii) Where planners determine that a section of land is critically endangered or has become unsuitable for human activities, they should propose a degree of protection, ranging from complete withdrawal to limited uses which promote natural recovery. This is particularly important in areas recently subject to severe degradation under the impact of human activities. Such areas may recover and be useful in the future, if they are protected for a prescribed period and given reclamatory treatment as required. Possibilities of limited or alternative use could also be explored;

(*d*) Develop procedures for implementing a comprehensive land-use plan, which should constitute a part of the planning process and not a separate activity. A comprehensive land-use plan specifies the preferred use for each section of the area covered, but the current or intended use of the section is not always the same as that in the plan. Specifically:

(i) A procedure should be established by legislative action to resolve national, regional or local conflicts among competing users and uses of land. It may

involve a system of incentives and penalties, such as grants-in-aid and differential taxation. It may also involve devising and implementing specific measures whereby the users of the land will take responsibility, either collectively or individually, for the condition of the land, particularly where a significant proportion of the users of land do not own, or are not directly responsible for, that land;

(ii) Systems of taxation, land tenure, water and mineral rights, agricultural credit, insurance, marketing, and transport should be reviewed by the interested Governments, to ensure that they will encourage compliance with the comprehensive plan. Legislation relevant to exploitation and protection of natural resources should be reviewed and when necessary revised or supplemented to ensure consistency with the plan;

(iii) There are many possible enforcement or implementation schemes. Research and analysis are required to determine the best scheme for a particular country or province/state. Pilot projects demonstrating the implications of a proposed land-use plan, which could be organized in co-operation with MAB or similar programmes, are essential preliminaries to large-scale efforts. Efficient training of the managers and intermediate-level technicians required is of the utmost importance;

(*e*) The land-use plans should be fully integrated with regional planning and development plans.

26. This recommendation also implies regional action, through the appropriate regional bodies and with the help of international organizations, to:

(*a*) Strengthen the existing regional institutes for economic and social development and planning, as well as other appropriate regional institutes for the training of land-use planners and managers;

(*b*) Strengthen the natural and human resources survey institutions in the countries concerned, upon their request, on a regional basis, and with international support;

(*c*) Organize pilot projects for the implementation of comprehensive land-use plans in each of six major regions affected by or vulnerable to desertification in co-operation with or in addition to national pilot projects (Sudano-Sahel, Africa south of the Equator, North Africa, West Asia, South Asia, Latin America); such projects should be organized upon request of and, so far as they are able, implemented by interested Governments, with appropriate coordination and assistance from members of the United Nations family, such as UNESCO (MAB Programme) and the regional commissions;

(*d*) Organize short-term training courses on the Implementation of comprehensive land-use plans for extension officers of the countries concerned.

Recommendation 3

27. Successful prevention and combating of desertification depends on public awareness and participation. People must be directly involved in the making of decisions that profoundly affect their

lives. The involvement of people will also be an important means of making creative use of their experience, ingenuity and skills, thus making effective use of often untapped resources.

It is recommended that public participation be made an integral element of the prevention and combating of desertification and that account be thus taken of the needs, wisdom and aspirations of the people.

28. This recommendation implies national action to:

(*a*) Increase general awareness of the problem of desertification and a better scientific understanding of new and old technology through education, group discussions, exhibitions etc. In rural schools, training centres and extension services, as well as in appropriate institutes and universities, programmes for teaching the proper use of land and other natural resources should be initiated and strengthened;

(*b*) Design the process of planning the effort to combat desertification to ensure maximum public participation. Such measures could include extended visits by responsible officers to vulnerable groups and areas, encouragement of the formation of organizations for the channelling of views from different groups, division of the planning process into stages to show when important decisions should be taken and the publication of intelligible and illustrative material on the decision-making process;

(*c*) Achieve mutual understanding and trust among all parties concerned in the effort to combat desertification by stimulating public participation, making arrangements for joint discussions and using the mass media to provide a forum for public participation and debate;

(*d*) Ensure the participation of sectors of the population whose role has traditionally been limited. This would require the expansion and strengthening of the role of community organizations, the provision of education and information and the decentralization of the planning and management of action against desertification.

B. THE COMBINATION OF INDUSTRIALIZATION AND URBANIZATION WITH THE DEVELOPMENT OF AGRICULTURE AND THEIR EFFECTS ON THE ECOLOGY IN ARID AREAS

29. The development in arid areas of industry, mining, towns and transport is accompanied by various ecological changes. There are numerous examples of cases in which industrialization or urbanization has led to or accelerated the processes of desertification, pollution or wind erosion. However, the experience of many countries shows that programmes for the development of arid lands (through the building of power stations, new towns and villages, and mines; oil production; and heavy and light industry) based on sound ecological and sociological principles can form the basis for the full utilization of local manpower, the supply of adequate water to towns, industry and agriculture, high labour productivity, and a high material and cultural level of living for the people of such areas. The industrialization of arid areas can create the necessary energy and make it possible to use advanced technology in the implementation of measures to combat desertification. For this reason it is recognized that all aspects of scientific and technical work aimed at discovering natural resources and, above all, mineral resources in arid areas, particularly in the developing countries, must be developed and strengthened.

Recommendation 4

30. It is recommended that steps be taken within the framework of the programme and budget of UNEP, and in conjunction with the United Nations Development Programme (UNDP), the United Nations Industrial Development Organization (UNIDO) and other appropriate United Nations organizations, as well as interested countries, to:

(*a*) Study and publicize positive and negative local and world-wide experience of the role which industrialization and urbanization play under different social and economic conditions in changing the ecological status of the environment and intensifying, preventing or eliminating the processes of desertification in arid areas;

(*b*) Consider the feasibility of organizing and holding in the period from 1978 to 1980, under the auspices and at the expense of UNEP, several regional meetings and one general international meeting for the discussion of national, regional and world-wide experience of combining industrial development and urbanization in arid areas with crop and animal husbandry, irrigated farming, and forestry;

(*c*) Provide arid-zone developing countries with regular scientific advice on studying and planning industrial and urban development programmes in arid zones if the concerned countries so wish;

(*d*) Publish reviews and monographs illustrating the successes of arid-zone countries in promoting economic and social development while preserving the environment.

C. CORRECTIVE ANTI-DESERTIFICATION MEASURES

Recommendation 5

31. Water shortage is one of the main factors limiting production and settlement in dry lands, and lack of water or its inefficient use are fundamental causes of many desertification problems. Rational assessment of water needs, improved water supplies, reduction in water losses, more efficient use of water and the development of new water resources are called for in many of the recommendations proposed. The United Nations Water Conference held at Mar del Plata, Argentina, from 14 to 25 March 1977 reviewed the general world water situation, and adopted the Mar del Plata Action Plan directed to solving the water problems facing the international community, as well as specific resolutions on the role of water in combating desertification and on drought loss management. These recommendations include *inter alia* some measures relating to specific problems of dry lands and drought-prone areas subject to desertification. The present Plan of Action to Combat Desertification, in full conformity with the recommendations of the United Nations Water Conference and in addition to them, puts forward a specific recommendation on the management, development, distribution, control and regulation of the use of water resources to suit the nature and potential productivity of the areas concerned. This recommendation does not intend to replace or amend the Mar del Plata Action Plan, but rather specifies the actions required for this particular purpose. It should be implemented as a part of the Mar del Plata Plan, in the framework of the general water policies adopted by Governments and as a part of the campaign against desertification.

It is recommended that efficient, socially, economically and environmentally sound planning, development and management of water resources be introduced as part of measures to combat desertification.

32. To implement this recommendation, national action should be considered to:

(*a*) Improve data on the quantity and quality of available water, by *inter alia*:

(i) Establishing or strengthening a national co-ordinating body with comprehensive responsibilities for water-resources data, and establishing water-resources data banks, preferably in collaboration with a national resource data bank;

(ii) Expanding and extending the network of meteorological, hydrogeological and hydrological stations (as already stated in Recommendation 1), taking a longterm view of future needs and employing, as far as possible, standard techniques and instruments in order to obtain comparability of data;

(iii) Establishing or strengthening systems and facilities for the measurement of existing water use, and for monitoring changes in water quality;

(iv) Regular assessments of surface and groundwater resources, preferably in terms of the water balance, both for individual basins and at the national level;

(v) Regular assessment of geochemical budgets affecting water use;

(vi) Providing national machineries for the use of modern technologies, including geophysical and remote sensing techniques, analog and mathematical models, in collecting and processing data on the quantity or quality of water resources;

(*b*) Develop and keep under review schemes of water management, as part of a regional and national strategy which is based on a proper balance between social, economic and cultural factors, on the one hand, and purely ecological considerations and constraints on the other. This should be accomplished by, *inter alia*:

(i) Ensuring, through proper institutional arrangements, that the development and management of water resources take place in the context of national planning and that there is real co-ordination between all bodies responsible for the investigation, development and management of water resources;

(ii) Estimating the demand for water for different purposes at different periods of time in conformity with national development goals. In this context the need for awareness of the risks of increased ecological stress from an excess of water should be noted;

(iii) Keeping under review existing legislative (including environmental aspects) and administrative structures concerned with water resources and enacting comprehensive and unifying legislation based on the concept of the public control of water resources, defining the rights, obligations and responsibilities of the State and the individual with respect to its use, and taking into account the proportionality of development in the various economic and social sectors to ensure the utilization and protection of water in the interests of the whole of society;

(iv) Ensuring public participation in the planning process at a time when it can

constructively influence the choice between alternative possibilities;

(*c*) Promote the efficient use of water by, *inter alia*:

(i) Applying the results of studies on appropriate levels of water use and re-use by the various sectors of the economy;

(ii) Creating economic incentives for increasing the efficiency of water use;

(iii) Enacting legislation on efficient water use and conservation;

(iv) Establishing a system of supervision of water use and pollution control including measures to prevent saline water intrusion from the sea, in both surface and ground waters;

(v) Applying advanced techniques of water storage, conservation and distribution;

(vi) Conducting studies and experiments concerning the adaptation of innovative or imported technologies in the light of available resources and prevalent social and environmental conditions;

(vii) Giving priority to support for the development of technologies that take full advantage of local experience and resources;

(viii) Promoting the use of locally available manufacturing or construction materials;

(ix) Developing facilities for the servicing and maintenance of spare parts;

(x) Making an inventory of traditional water collection and distribution systems, and improving them with suitable techniques;

(*d*) Provide adequate and uncontaminated community water supplies, sanitation, and waste disposal services with targets and time-tables for each country, taking into account its social and economic conditions, through:

(i) Rainwater collection by roofguttering into cisterns or suitably lined pits;

(ii) The purification of surface water;

(iii) The use of pumps and pipe systems as means of protecting dug wells and springs from local contamination;

(*e*) Improve the supply and quality of surface water through:

(i) Management of hydrological systems and revegetation of watersheds in conjunction with measures to reduce erosion, flood hazards and siltation;

(ii) Establishment of water harvesting schemes;

(iii) Promotion of the construction of small low cost reservoirs and the use of hand-dug wells and manual apparatus, where available;

(iv) Construction, where appropriate, of large dams which can make a decisive contribution to the establishment of a balanced food supply, safeguard the environment, and assist in combating desertification and improving living conditions in general;

(v) Reduction of seepage and evaporation from reservoirs;

(vi) Promotion of the reduction of eutrophication and the rehabilitation of surface water;

(vii) Improvement of water distribution, including the use of different types of pipes and channel linings made from local materials;

(viii) Improvement of the infiltration characteristics and water storage capacity of soils;

(*f*) Promote measures to improve the supply and quality of ground water and its management, by:

(i) Controlling development and siting of wells and pumps;

(ii) Improving maintenance of wells and pumps;

(iii) Monitoring ground water level and quality;

(iv) Preventing ground water pollution, including the intrusion of saline ground water or drainage waters into aquifers through overpumping and saline water intrusion from the sea;

(v) Using solar and wind energy for pumping;

(vi) Promoting schemes for ground water recharge and subsurface storage and purification of water;

(vii) Setting national water quality criteria for ground water to be used for human consumption to meet national requirements;

(*g*) Promote measures to reduce or eliminate water-borne diseases through, *inter alia*:

(i) Proper management of liquid and solid wastes, for example, composts;

(ii) Food hygiene;

(iii) Improved design and construction of housing by means of appropriate technology, making the best use of locally available materials and drawing on the positive features of traditional technology;

(*h*) Introduce appropriate methods of water recycling and water pollution control, use of brackish water, desalination and purification;

(*i*) Launch general campaigns for education in efficient and responsible water use, using public information services and seeking community participation through appropriate organizations;

(*j*) Promote research into:

(i) Weather modification, evaporation reduction and increase of water condensation;

(ii) Means of increasing the efficiency of water use for plant production;

(iii) Application of system analysis to water resources planning and management.

33. This recommendation also implies regional action, involving the United Nations regional commissions and other appropriate bodies, including action for the development of the wise and efficient management of shared water resources[*1*] for rational use within regional economies, as suggested by the Mar del Plata Action Plan of the United Nations Water Conference. Such action is illustrated particularly by the feasibility study on transnational co-operation in the shared use and management of large aquifers in Northeast Africa and the Arabian Peninsula. Suggested measures for regional co-operation might include, as appropriate:

(*a*) Transnational projects for studying, screening, processing, interpreting and integrating available data and for defining management guidelines for rational, economical and sustained exploitation of regional aquifers, for example in Northeast Africa and the Arabian Peninsula;

(*b*) Shared use and management of shared water resources which transcend national boundaries, with emphasis on areas where the supply of water is endangered in terms of quantity, quality and availability;

(*c*) Establishing regional data banks, water resources institutes and training and research institutes for water specialists or strengthening those that exist;

(*d*) Supporting and establishing regional bodies, when needed, through which international cooperation could be achieved in the collection, standardization and exchange of data; the co-ordination of watershed management; the prevention and control of water pollution; flood control and river improvement; flood-warning systems, etc.;

(*e*) Creating regional teams of experts, at the request of the interested Governments, to carry out in adjacent countries common studies of water demand, ground water and surface water assessment, reconnaissance of dam sites, etc., to enable the countries to work together over an extended period of time and under similar technical conditions;

(*f*) Developing and strengthening regional activities concerning the assessment of surface and ground water resources, particularly within the framework of UNESCO's International Hydrological Programme and WMO's Operational Hydrological Programme.

Recommendation 6

34. The degradation of rangelands is the most widespread form of desertification associated with animal-based livelihood systems, and, even in the absence of climatic change, has resulted in impoverishment of, and in physical and social hardship among, many dryland pastoral communities. Regeneration of rangelands and rangeland management designed to sustain productivity in the long term are the main objectives of combative measures. In these high-risk environments, it will be advantageous to integrate systems of rangeland pastoralism and dry and irrigated farming, and to encourage diversification. Remoteness, scattered distribution and the traditional mobility of pastoral peoples have made it difficult to provide them with adequate health and social services. These and related disadvantages must be remedied, with measures to assist sedentarization and resettlement where appropriate.

It is recommended that measures should be taken to prevent desertification and to ameliorate the condition of degraded rangelands, to introduce suitable systems of rangeland and livestock and wildlife management, to develop diversified and integrated systems of production and to improve the living conditions of the inhabitants of those areas.

35. This recommendation calls for national action to:

(*a*) Prevent the degradation of rangeland and improve already degraded rangeland through:

(i) Surveys of the condition of the rangelands and the extent and intensity of desertification by the establishment of a permanent monitoring network;

(ii) Measures to aid regeneration, such as rotational or deferred grazing, temporary protection from grazing, seeding or planting of desirable and adaptable forage plants and trees for shelter, fodder reserves and firewood and the physical and chemical treatment to aid the re-establishment of plant cover in denuded areas as well as the proper spacing of water points in different areas;

(iii) Water and soil conservation;

(*b*) Develop improved grazing strategies through:

(i) Assessment of the productivity of range types under a variety of conditions;

(ii) Determination of the impact of grazing on rangeland associations and their requirements for regeneration;

(*c*) Develop improved range management, through:

(i) Determination of appropriate carrying capacities and stocking rates of various herbivores in various livestock management systems compatible with spatiotemporal diversity of feeding resources;

(ii) Measures to facilitate the planned use of rangelands, including the provision of managed water points for multiple use and fencing to control the grazing animals, in order to minimize damage to rangeland near water points and

provide sustained long-term utilization of rangeland;

(iii) Establishment of pilot or demonstration projects to demonstrate range management, particularly aspects concerning bush control and the use or misuse of fire;

(*d*) Improve livestock management, through:

(i) Improvement of existing stock, selection of local breeds, the introduction of new breeds and species and the improvement of herd structure;

(ii) Control of animal diseases and pests, especially control of animal trypanosomiasis and control of poisonous plants in range areas;

(iii) Development of relevant methods of livestock management and their promulgation through extension services and demonstration projects;

(*e*) Improve the management of wild fauna through:

(i) Measures to restore the potential of adapted fauna to exploit marginal habitats;

(ii) Improved methods of utilization of wild fauna, including ranching, domestication of new species, etc.;

(iii) Better wildlife management techniques, including the establishment of stocking and offtake rates and control of predators and disease;

(*f*) Develop strategies to deal with the effects of droughts, through:

(i) Establishment of drought forage stocks and drought grazing reserves;

(ii) Optimization of the use of dryland crop residues, agro-industrial waste and low-quality forage in general;

(iii) Provision of means for removing stock from drought-affected areas;

(iv) Local water harvesting or irrigation schemes for the production of forage, food and tree crops as a programme for diversifying pastoral diets;

(v) Integration with adjacent livelihood systems;

(vi) Means for the reduction of stock numbers, including improved marketing facilities and feedlots and introduction of mobile abattoirs;

(*g*) Develop strategies to deal with other climatic extremes, e.g. frost, floods, snow, heat, hurricanes, sand and dust-storms, etc., through:

(i) Creation of shelters for man and animals;

(ii) Provision of forage and feed stocks;

(iii) Establishment of carefully sited artificial and natural wind breaks;

(iv) Special provisions to maintain water supplies for stock;

(*h*) Strengthen the economic basis of the pastoral industry by:

(i) Establishing trek routes, transport and marketing facilities, and price stabilization schemes;

(ii) Considering the use of price controls to protect the livestock breeder in relation to other primary producers and the consumer;

(iii) Overcoming social and cultural obstacles to socio-economic management, for example, of herds, through information campaigns;

(*i*) Treat rangelands forming part of a forest agricultural ecosystem, as functional units, by studying, designing and applying forestry, agricultural and stock-raising production systems which take into account their mutual connexions and inter-relations so as to give rise to economically and socially stable systems;

(*j*) Establish fisheries projects in small reservoirs for the purposes of food production;

(*k*) Establish improved systems of land tenure and water rights that are conducive to integrated rangeland management;

(*l*) Protect the rights of pastoralists through:

(i) Planned land use and improved land tenure systems, supported by appropriate legislation, information and education;

(ii) Regulation of alternative land uses such as tourism;

(*m*) Promote comprehensive study of the primary and secondary productivity of ecosystems, including rangelands;

(*n*) Promote alternative livelihood sources, such as craft industries, tourism and utilization of the non-fodder plants of the rangelands as raw material for industrial purposes (for production of fibre, alcohol beverages and medicines), provided that such actions would not add to the process of desertification and that scientific, technical and economic studies prove that income from the utilization of such plants would exceed the income derived from the use of the land as rangeland;

(*o*) Provide health, welfare, and education services compatible with dispersed and mobile populations, for example through the use of radio;

(*p*) Assist with resettlement or partial sedentarization;

(*q*) Involve pastoralists from the outset in the planning and implementation of all measures

that affect them;

(*r*) Provide preventive measures to control human diseases related to livestock and wildlife;

(*s*) Develop the network of existing small settlements functioning as central places in the contact zone between nomadic and sedentary land use in order to provide social, educational, health and such other services as are required for livestock production.

36. This recommendation also implies regional action to:

(*a*) Employ regional research centres and other suitable national or local institutions, such as universities, in the task of developing drought-resistant, high-yield and nutritious forage plants and of organizing mechanisms for their widespread distribution. Such centres should also apply themselves to research and activities directed toward the improvement and adaptation of livestock and wildlife;

(*b*) Implement and share, through dissemination of results, the experience gained from the transnational project on management of livestock and rangelands to combat desertification in the Sudan-Sahelian and North African regions, as described in the feasibility study (A/CONF.74/26), or from any similar programme following it;

(*c*) Strengthen and promote the implementation and development of the regional pilot projects proposed under MAB projects 3 and 4 and the EMASAR programme relevant to arid and semi-arid rangelands.

Recommendation 7

37. Areas of rain-fed farming in arid, semi-arid, sub-humid and other zones subject to desertification have undergone extensive desertification through gullying and sheet erosion, blowing away of soil, sand drift and growth of dunes, and salinization. Degradation has followed extensive clearing, exposure and powdering or compacting of the topsoil, clean fallowing, and excessive mechanical treatment. It is linked with the loss of soil fertility and the breakdown of soil structure after continuous monoculture. A major factor in degradation has been the extension of farming into areas where the risk of drought is high or onto marginal terrain, often under pressure from an increasing population. In the dry tropics, degradation is associated with the shortening of cycles in farming and regrowth systems, again linked with population pressure. Some desertification has also resulted from the deterioration of terraces and other structures built for soil conservation, due often to a shortage of labour, as in areas of strong outmigration. The consequences have been lowered yields and loss of productive lands, with resulting economic, physical and social hardship, often associated with high rates of emigration. Deterioration has adversely affected neighbouring animal-based livelihood systems.

38. Combative measures for soil and water conservation must form part of comprehensive reclamation schemes, including for example vegetation recovery on watersheds. They may involve the removal of land from cultivation, the consolidation of holdings, and resettlement schemes linked with alternative forms of livelihood.

It is recommended that comprehensive measures should be adopted for the conservation of water, conservation and improvement of soil, and rational use of soil moisture in order to prevent and fight desertification in rain-fed agricultural areas.

39. To implement this recommendation, national action would be required to:

(*a*) Survey affected areas to determine land capability, degradation hazards and climatic risk, and put forward proposals for appropriate land use and management;

(*b*) Assist in the introduction of improved, appropriate crop systems, including cover crops, rotational systems with legumes, rational use of organic and chemical fertilizers, careful soil cultivation and tillage and proper use of plant remains, and of appropriate windbreaks to reduce exposure of soil and maintain fertility and soil structure;

(*c*) Establish legal limits to cultivation by tractor ploughing in marginal dry lands, which are ecologically better suited for grazing;

(*d*) Assist in the reconstruction and introduction of works such as terracing for soil conservation and water spreading, and, above all, make provision for adequate maintenance of these works;

(*e*) Encourage the adoption of measures to counter erosion, such as strip cropping, shelter belts, protective forest belts, structures for water control, use of soil conditioners, run-off farming, etc.;

(*f*) Reclaim degraded lands by such actions as the stabilization of sandy surfaces and dunes and the checking of gully systems;

(*g*) Assist in the revegetation of watersheds, upland pastures and woodlands and their protection from excessive grazing, cultivation or cutting for fuel where this entails a risk of desertification;

(*h*) Encourage diversification in farming systems, with appropriate inclusion of livestock and arboriculture;

(*i*) Encourage changes in those land tenure systems which are incompatible with the introduction of improved agriculture;

(*j*) Take appropriate measures to protect land from erosion resulting from civil engineering works such as roads and quarries.

40. The recommendation implies regional action to develop, through national and regional institutions such as universities and research establishments, improved agricultural techniques which resist desertification and drought-resistant crop varieties. This action will include the establishment of regional programmes for the application of soil conservation techniques in conjunction with the programmes of FAO.

Recommendation 8

41. Irrigation supports the closest settlement in arid lands, represents the most intensive form of primary, land use, and is potentially highly productive. Irrigation of desert land is a very powerful means of increasing land productivity and controlling desertification; as a long-term action, it is desirable that new arid lands should be brought under irrigation, if enough water is available and the soils are suitable, on the basis of integrated construction and development. Nevertheless, many irrigation projects are severely

affected by desertification. Waterlogging and secondary salinization or alkalinization of soils have caused a reduction in crop yields and the abandonment of irrigable lands, and farm incomes in the areas affected have come too low for an adequate livelihood. Irrigation is costly, and requires skilled techniques if its benefits are to be realized; however, many irrigators need extension services as well as an access to capital and improved marketing facilities. Desertification in irrigated agriculture is commonly linked with the lack of incentive or opportunity for self-improvement. Many problems arise from the close settlement associated with irrigation schemes; such problems include disease, inadequate housing and community services, and the lack of alternative employment for the families of irrigators.

42. Note should be taken of the recommendations and targets fixed by the World Food Conference in 1974, which established two major priorities for the joint development of land and water resources. The first of these is the improvement and rehabilitation of existing irrigation schemes, which are not now being fully utilized, with the result that potential output is lost, water wasted and productive land damaged. It was estimated that remedial action within a ten year programme (starting from 1975) should extend to some 50 per cent of the 90 million irrigated hectares in the developing countries alone. Secondly, the target of a 25 per cent increase in irrigated area was suggested for the same ten year period. In any one country, the relative importance of new schemes and improvements of existing schemes will be decided by economic and social conditions, together with other constraints such as the availability or shortage of water or land, but at the global scale the greater urgency is for the rehabilitation and improvement of existing schemes. To help achieve the goals and targets of the World Food Conference and to combat desertification in irrigated lands, the following recommendation is made.

> *It is recommended that urgent measures be taken to combat desertification in irrigated lands by preventing and controlling waterlogging, salinization and alkalinization; by reclaiming deteriorated lands; by improving irrigation and drainage systems; by modifying farming techniques to increase productivity in a regular and sustained way; by developing new irrigation and drainage schemes where appropriate, always using an integrated approach; and through improvement of the social and economic conditions of people dependent upon irrigation agriculture.*

43. To implement this recommendation, national action is called for to:

> (*a*) Improve water management in irrigated agriculture in order to reduce the losses due to irrigation through such measures as:
>
> > (i) Selection of irrigation methods appropriate to the natural conditions (climate, topography, soils, depth and salinity of groundwater, quantity and quality of irrigation water, etc.) and socio-economic conditions (investment and maintenance costs, energy and labour requirements, marketing, etc.), and guaranteeing as uniform a supply of water as possible, thus reducing water losses during irrigation;
> >
> > (ii) Reduction of water losses during storage, transportation and distribution, through improved design, lining, construction and maintenance of canals and appropriate irrigation methods;
> >
> > (iii) Adoption of appropriate water pricing policies with a view to encouraging the efficient use of water with due regard to social objectives;

(iv) Watershed management to reduce sedimentation and flood risks;

(v) Determination of the water requirements of crops and the establishment and enforcement of appropriate irrigation schedules;

(vi) Appropriate design of field and crop systems in schemes based on groundwater, in an effort to sustain water supplies;

(vii) Proper maintenance, control and operation of distribution systems, joint use of surface and groundwater, and recycling of waste water;

(viii) Advising farmers on the efficient application of water and associated tillage to retain soil moisture;

(*b*) Improve drainage and salt-leaching in irrigated lands, where this is economically feasible and socially justifiable, through such measures as:

(i) Investigating soil-water properties, return flow characteristics, hydrogeology and salinity of groundwater and soil geochemistry before and after construction or reconstruction of irrigation schemes;

(ii) Providing adequate drainage systems to maintain harmful groundwater below the active root zone;

(iii) Providing adequate water for the leaching of salt;

(iv) Undertaking reclamation of salinized, alkalinized or waterlogged soils;

(v) Establishing a network of stations to monitor groundwater and salinity conditions;

(*c*) Improve irrigated farming systems through such measures as:

(i) Devising appropriate cropping systems in the light of soil surveys and the availability of water;

(ii) Establishing pilot or demonstration projects;

(iii) Introducing new species and varieties of crops, including the selection and development of salt-tolerant crops where fresh water is limited and agriculture is possible only with saline water;

(iv) Advising farmers, through effective and sound extension services, on appropriate farming and irrigation techniques, on the selection of crops to be grown and lands to be irrigated on the basis of water quality, and on the proper use of fertilizers and pesticides;

(*d*) Establish new irrigation schemes, as appropriate, taking into consideration the need for:

(i) Planning and conduct of irrigation programmes in such a way that the

provision of surface and subsurface drainage is treated as an integral and indispensable component;

(ii) Environmental impact statements as part of the planning of hydraulic structures for irrigation or energy production, including consideration of the positive and negative consequences of action that influences the environment;

(iii) Prediction of salinization, alkalinization and water-logging hazards (based on factorial salt-balance studies) due to a given action, determination of the possibilities for their prevention, and recommendation of preventive measures;

(iv) Appropriate schemes of land division that facilitate the effective application of the above measures;

(v) Studies of soil properties in experimental plots to be established within each irrigated district;

(*e*) Improve the social and economic conditions of people earning their livelihood from irrigation agriculture by:

(i) Providing capital, and/or purchasing and marketing facilities, for example through agricultural co-operatives;

(ii) Encouraging ancillary agricultural activities, such as livestock rearing or tree culture;

(iii) Providing adequate sanitation, domestic water supplies and control of water-borne diseases;

(iv) Providing adequate infrastructural and social services in newly established settlements.

Recommendation 9

44. There is a need to restore and maintain vegetation cover and to stabilize and protect soils in denuded areas, especially those affected by intense human impact, for example around settlements and in open cast mines. Because deforestation is one of the principal causes of desertification, efforts to revegetate denuded land will often include the planting of perennial woody plants. The establishment of shelter belts and other tree plantations can be an essential part of the reclamation of degraded areas. This includes the requirement to stabilize moving sands by planting woody species, where possible, and halt dune advance where land use, communications or settlements are threatened. Revegetation of desert uplands is necessary for soil and water conservation and flood control. On a larger scale, "green belts" are called for to promote revegetation, soil conservation, planned land use and environmental protection along some desert margins and in other sensitive areas.

It is recommended that existing vegetation be maintained and protected, and that special measures be taken to revegetate denuded areas and then maintain and protect them to promote soil conservation, and to stabilize moving sands. This may be necessary in areas where human activity may have an adverse environmental impact in hilly areas and on mountain slopes, particularly at points where deterioration may threaten settlements, roads,

farm lands and reservoirs; and along vulnerable desert margins.

45. To implement this recommendation, national action is desirable to:

(*a*) Stabilize and revegetate lands degraded by mining, industry, tourism or other non-agricultural activities, and prevent further degradation through:

(i) The establishment or strengthening of existing, and the creation where necessary of new, extension and publicity services, including pilot demonstration projects and educational programmes to create an informed and favourable public attitude towards reclamation and conservation in degraded areas, and secure the co-operation and participation of communities in the proposed measures. Similarly, because tree plantations are longterm investments and require long-term planning, a high level of education is needed for understanding their ultimate usefulness; this fact should be particularly considered in information and education programmes;

(ii) Legislation requiring responsible organizations to undertake reclamation, and controlling further developments through conservational requirements based on environmental impact assessments;

(iii) Research into methods for stabilizing and revegetating degraded surfaces in desert areas, including soil treatments and the selection or development of drought-resistant and salt-tolerant plants;

(iv) Taking steps where necessary to study the environmental impact, including the impact on the local population, of any kind of public or private work of an infrastructural or industrial nature before such work is carried out, as well as of the introduction of exotic species;

(*b*) Establish, around settlements, along roads and in other areas of intense human pressure, fenced reserves in which grazing, traffic and fuel-gathering are strictly controlled;

(*c*) Take necessary steps to promote the protection, conservation, and, where necessary, reconstitution of hedges and windbreaks;

(*d*) Control open spaces in settlements through revegetation, provision of stable pavements, and planting of shelter belts;

(*e*) Control the harmful effects of traffic, particularly in and near settlements and at route intersections, by surfacing and fencing roads;

(*f*) Evaluate the impact of all-terrain vehicles, whether aquatic, land or amphibious, on the natural environment and its resources and apply such regulations and controls to these vehicles as may be necessary to prevent them from degrading the environment. National land-use plans should identify areas in which all-terrain vehicles may be used or prohibited, particularly vehicles intended for sport, recreation or tourism, in accordance with the conditions prevailing in each country.

(*g*) Take the necessary steps to ensure that in planning roads, their impact on the

environment should be studied before they are built in mountainous, swampy or other areas which, for some reason or other, have remained in their natural state as national parks, reserves or sanctuaries for wildlife, and in natural areas in which no direct economic exploitation is to take place. The construction of railways through such areas should be avoided;

(*h*) Revegetate watersheds for the improvement of the hydrological balance and soil conservation, as part of general programmes of catchment management. Entire basins should be regarded as ecological units in which joint efforts are directed towards comprehensive development, with the full participation of all segments of the population;

(*i*) Prevent soil loss through dust storms, sand drift and dune movement, with priority being given to areas where settlements, communications, farm lands, and important installations are threatened, by:

(i) Surveying the extent of dust and sand drift and dune advance, and establishing the effective wind regime and sand and dust sources;

(ii) Checking sand drift by stabilizing sand surfaces, erecting fences, revegetating source areas and planting shelter belts;

(iii) Stabilizing sand surfaces by the use of matting, mulches, chemical, bituminous or any other economically viable products, vegetating dune surfaces, reshaping dunes and removing slip faces where necessary;

(iv) Controlling land use in areas of stabilized dunes;

(*j*) Reduce the impact of the collection of plant material and manure for fuel, through:

(i) Restrictions on fuel-gathering in sensitive areas;

(ii) Establishing tree plantations for the controlled production of firewood and timber for house construction and other necessary uses;

(iii) Making available alternative heating and cooking devices, as suggested by Recommendation 19.

(*k*) Create "green belts" consisting of mosaics of revegetated areas, improved pastures, tree plantations, fruit gardens, protected reserves and planted shelter-belts in zones of conservation and controlled land use, along desert margins, and in areas of intense human pressure;

(*l*) Strengthen national forest and range management, soil and water conservation services and other organizations involved in implementing these recommendations, including their advisory arms;

(*m*) Protect tree plantations and other revegetated areas effectively and for a sufficient time against uncontrolled grazing and destructive land use;

(*n*) Introduce adequate monitoring systems which will detect changes in the status of

vegetation;

(*o*) Take measures, if necessary in close cooperation with neighbouring countries, to control the use of fire and fight uncontrolled fires and other causes of severe damage.

46. The present recommendation also implies regional action for the production and distribution of the plants necessary for the vast programmes of revegetation and the institution of the measures proposed in the feasibility studies of transnational co-operation.

Recommendation 10

47. Ecological equilibrium plays a vital role in the prevention of environmental degradation processes likely to lead to desertification, and wildlife plays a vital role in maintaining this equilibrium.

It is recommended that Governments should take all necessary steps to ensure the conservation of flora and fauna in areas subject or likely to be subject to desertification.

48. To implement this recommendation, national action should be considered to:

(*a*) Adopt regulations governing the import, sale, exhibition or use of parts of any wild animal or native plant that is threatened, or likely to be threatened with extinction, such as skins, hides, ivory, feathers, entire stuffed animals or parts thereof, etc., with the exception of specimens belonging to species that are not endangered or are reared in captivity for this purpose with the approval of the competent authority, those which are reared at official breeding stations, and those which are bred for scientific or research purposes in conformity with established ethnic, social or cultural traditions;

(*b*) Adopt regulations governing the import, sale or collection, whether for exhibition or not, by private persons or institutions, of live wild animals and native rare plants of any species, with the exception of those intended for official zoos and specimens intended for scientific purposes;

(*c*) Ensure that, in cases where the exceptions mentioned in the preceding paragraph are applicable, the specimen or specimens of animals in question is or are transported in such a way as to avoid unnecessary suffering and prolonged confinement, which constitute an affront to civilization. Each country shall prescribe the conditions in which such transport is to take place in the light of the objectives of this recommendation;

(*d*) Where this has not already been done, sign, ratify and implement the Convention on International Trade in Endangered Species of Wild Fauna and Flora.

49. Regional co-operation is required in respect of fauna and flora protection and management, particularly on the fringes of national parks and where a certain ecosystem extends across international boundaries.

Recommendation 11

50. There is a need to arrest and control desertification processes which are linked to climatic, hydrological or pedological conditions and the ecological conditions of land, water, plants or animals. The following Recommendation constitutes the counterpart, with respect to physical systems and natural

or cultural or artificial ecosystems, of Recommendation 16 concerning monitoring of the human condition. The indicators and criteria necessary for monitoring of the above-mentioned conditions are listed in chapter III, sections A and C of the Plan of Action.

> *It is recommended that national or intraregional systems for monitoring climatic, hydrological or pedological conditions and the ecological conditions of land, water, plants or animals be established or strengthened, as appropriate, in areas affected or likely to be affected by desertification.*

The particular nature of the monitoring systems in question is indicated in earlier paragraphs; since such systems are often presented in sectoral form, it is suggested that a global, integrated and interdisciplinary approach be adopted whenever possible.

D. SOCIO-ECONOMIC ASPECTS

Recommendation 12

51. Although the climatological and ecological aspects of desertification are important considerations, they constitute only one dimension of the problem. Socio-economic factors also require intensive analysis and remedial action.

52. The socio-economic aspects of desertification include both the impact of the process on man, his welfare and his institutions, and consideration of social and economic behaviour and systems as a primary *cause* of desertification. Attention to the latter has lagged behind the former. In particular, greater account must be taken of the inequalities of resource availability, resource development and resource transfers which exist among and within countries. Inequalities in capital transfer between national and international economic interest, and between rural and urban areas, are of special concern. Such inequalities have their most severe impact on the poorer nations, and on the poorest people in these nations, particularly those constrained to live in the marginally productive lands of semi-arid and arid areas.

53. Various situations of a structural nature have the effect of hampering the organized participation of rural populations in the development process. The task of combating desertification requires that the less well-endowed regions, and the rural populace, be more intimately involved in the planning and management of their resources.

54. In view of the need to satisfy growing world food requirements, there is no alternative to the incorporation of these regions into a more rational system of productivity in the developing countries. This implies a better social organization of the rural population for productive purposes, especially where a system of smallholdings or any other traditional collective land-use system predominates.

55. It is important to note that, in the desertification process, ecological degradation is also due, to a considerable extent, to the essentially subsistence-level economies and activities of the inhabitants of the regions in question, resulting in overgrazing, rapid soil erosion and deforestation.

> *It is recommended that the social, economic and political factors which have an important bearing on desertification be analysed and evaluated, particularly the matter of inequitable relationships and methods to equalize them, not only at the international level, but also at the level of each country or region.*

56. This recommendation implies, among other things, the introduction in each region of a new educational system, giving special attention to adults, that will allow the population to become fully aware of the ecological aspects of development and at the same time create a sense of solidarity with future generations. Steps must also be taken to ensure the wider participation of the rural population, in an organized manner, in the preparation, implementation and evaluation of programmes aimed at combating desertification, the more sensible use of arid and semi-arid zones, and the improvement of living conditions in general. Lastly, it is considered necessary that these programmes include among their main objectives the satisfaction of basic needs, care being taken to avoid the creation of artificial needs and to respect the cultural heritage of different groups.

Recommendation 13

57. Present rates of population growth are unprecedented in human history. Population growth intensifies pressures on the vulnerable land areas by increasing the number of people who live in them--farmers, pastoralists and artisans--and by increasing global food requirements, already on the rise because of rising expectations. At the same time, population growth is accompanied by massive migration from rural areas to urban areas. In excessive proportions, rural migrants tend to come from the most active age-groups, creating labour shortages in rural areas. In certain areas, these shortages have contributed to the deterioration of agriculture, and have thus acted as a cause of desertification. At the same time, waves of rural migrants have compounded the problems of cities, often already overcrowded and ill-equipped to receive the migrants or provide them with employment and the basic amenities of life. Demographic policies, designed to resolve or ameliorate such problems, should be seen as a natural and necessary corollary to policies directed toward improved land use.

> *It is recommended that countries which so wish should adopt economic and demographic policies that will support programmes for improving land use and sustaining the productivity of agro-ecosystems in dry lands, including, as appropriate, maintenance of an adequate rural labour force, sedentarization of nomads and resettlement of migrants from rural to urban areas.*

58. Rural populations in the arid zones of the developing world are growing at approximately three per cent per year. Seldom in touch with modern medicine, nomadic pastoralists generally have higher death rates, and in consequence somewhat lower growth rates. It is unlikely that these rates of growth will decline substantially in the immediate future--indeed, the growth rates of pastoral populations may well rise before falling. In this situation, it can be anticipated that considerable numbers will continue to migrate from rural to urban areas. Problems associated with migration and resettlement can thus be expected to persist.

59. National action is desirable to ease the transition of dry land migrants into urban areas. Many developing countries have already initiated programmes to this effect--to assure migrants of housing and other social amenities such as education and health services and to supply them with counselling on employment opportunities. Countries affected by large-scale migratory movements can anticipate that programmes to ease the transition of migrants will be needed until at least the end of the century. Emphasis should be placed on the productive channelling of migration on the one hand, and on the provision of services to rural areas, on the other.

60. Seasonal or more permanent emigration is not proof that a rural area is disadvantaged: migration and remittance of money back home is often an essential and efficient mechanism of rural development. After determining the size and character of emigration from dry lands, countries so affected may wish to consider additional measures to reduce excessive losses of those in the most vigorous age groups. Improved land-use practices, as recommended elsewhere in this Plan of Action, will assist in this task by

enhancing the prosperity of the dry land economies. Other measures could consist in supplying services to dry land peoples, including the development of alternative sources of income. In the interests of social justice and demographic stability, the people of dry land areas should have access to social services and cultural amenities on a scale comparable with those enjoyed by other parts of the community.

Recommendation 14

61. Communities vulnerable to desertification are often far removed from centres of political power. Their populations are frequently dispersed and difficult to contact. This results in deficient health services, especially among nomads, and eventually in labour shortage. Because it appreciably reduces the productivity of the existing labour force, this ultimately leads to increased disregard for wise landuse practices, and hence to intensified desertification. Thus, in the absence of an adequate communications infrastructure, health care for such groups of the population should constitute an essential component of a programme to combat desertification.

> *It is recommended that programmes should be undertaken to provide peoples affected by, or vulnerable to, desertification with an adequate level of primary health care services, including family planning where necessary.*

62. To implement this recommendation, national action should be considered to:

> (*a*) Provide voluntary family health care and, for those Governments which so desire, family planning services so that people can exercise the parental right to decide on the number and spacing of their children in conformity with the Teheran Declaration on Human Rights, and to reduce rates of morbidity and mortality among both mothers and children, in conformity with the recommendations of the World Population Conference;
>
> (*b*) Provide the peoples concerned with primary health-care services, including attention to food and nutrition, potable water, home economics, immunization and vaccination, and the control of communicable diseases, to achieve the object of self-sustaining health programmes within the context of overall development; the areas affected by desertification would require provision of adequate fixed health stations, mobile health-team units or paramedical personnel, first-aid posts and air services; the resources of the local pharmacopoeia should be fully documented, developed and utilized.
>
> (*c*) Encourage the people concerned to participate in discussions and in the execution of health programmes; an integrated approach should be made by demonstrating appropriate primary health care techniques at different sites;
>
> (*d*) Control rodents which are carriers of pathogenic organisms;
>
> (*e*) Design programmes to provide adequate measures to prevent or control diseases which may appear in any new ecological situation created by the effort to combat desertification;
>
> (*f*) Develop and implement programmes for the improvement of nutrition in the areas concerned, including information, extension and educational aspects, bearing in mind the problems of metabolism among rural people in dry lands, which are quite different from those of people in urban areas;
>
> (*g*) Develop and implement programmes for the treatment of diseases related to the desert

environment;

(*h*) Where possible, introduce health criteria into policies for integrated land-use planning. Such criteria should be aimed primarily at preventive health care, and should include training and education of the population.

Recommendation 15

63. Action against desertification and for the reclamation of desert lands needs to include sound human settlements planning and the development of a better quality of life. Two points need to be noted:

(*a*) The principal causes of loss of productive land include urban expansion, establishment of industrial and tourist centres, and the building of highways and airports, etc. Land in desertified areas or areas vulnerable to desertification should be used for the purposes for which it is best suited, bearing in mind the competing needs which other users may have for it;

(*b*) Design of human settlements in territories prone to desertification or where populations affected by desertification are being resettled needs to take into consideration environmental, particularly climatic, conditions, social, behavioural and cultural needs, the quality of available building materials, and traditional experience and practices in building comfortable dwellings.

The following recommendation is made as a follow-up to the Plan of Action approved by Habitat: United Nations Conference on Human Settlements:

It is further recommended that human settlements in areas affected, or likely to be affected, by desertification be situated within the framework of a national land-use plan that safeguards, as a matter of priority, land with pastoral or agricultural potential, by avoiding the construction on it of permanent buildings or elements of infrastructure.

64. This recommendation calls for national action to:

(*a*) Incorporate in national land-use plans the following elements:

(i) Long-term perspectives envisaged by the national demographic policy (see Recommendation 13);

(ii) Long-term planning for national economic and social development related to sites for industrial development, sites for mines, oil-fields, recreation and tourism;

(iii) Long-term perspectives for agricultural and pastoral development (see Recommendation 2);

(*b*) Direct national machinery for science and technology to:

(i) Develop and adapt designs for human settlements appropriate to the prevalent climatic conditions and compatible with socio-cultural values and needs;

(ii) Survey traditional experience in settlement design and building architecture so as to collate the principles and guidelines that made traditional dwellings comfortable and, as appropriate, incorporate, traditional experiences into innovative modern designs;

(iii) Survey locally available building materials and their attributes related to the desert environment, and develop means for the best use of these materials or for their treatment to meet environmental needs;

(iv) Develop architectural designs for housing units that minimize the use of energy for cooling and heating;

(v) Develop designs which optimize the use of solar and wind energy for domestic and agricultural requirements;

(vi) Develop technologies appropriate to arid environments for the use and recycling of solid waste and sewage materials;

(vii) Design technologies and means for communicating information and services to distant, dispersed communities in areas affected by desertification;

(*c*) Develop, in the light of the scientific information referred to above:

(i) Appropriate planning and building standards and codes applicable to establishing, extending or revitalizing human settlements, whether urban or rural, dispersed or agglomerated;

(ii) Plans for establishing new settlements and redesigning and improving existing settlements in accordance with national land-use plans or programmes;

(iii) Mass-educational programmes aimed at harmonizing socio-cultural traditions with appropriate, environmentally sound designs of human settlements, and at optimizing the constructive and continuing participation of their inhabitants;

(iv) Appropriate legislation and administrative and co-operative machineries for enforcing approved codes and for ensuring community participation.

65. This recommendation calls for regional cooperation and exchange of information on:

(*a*) Traditional and new experience in the design of settlements, housing units and other structures; traditional experience which maintains or enhances the environment often transcends political boundaries and relates to climatic zones that are regional in extent;

(*b*) Available building materials and their environmental appropriateness;

(*c*) Regional research programmes involving national machinery for science and technology.

Recommendation 16

66. Monitoring of the human condition is required, first for assembling sufficient baseline data to make it possible to judge when serious deviations from the normal pattern have taken place, secondly for establishing an advance warning system that will use certain indicators to assess such serious deviations, and thirdly for establishing monitoring systems to measure the progress of a crisis.

It is recommended that national systems for monitoring the human condition be established or strengthened, as appropriate, in the countries affected or likely to be affected by desertification, always keeping in mind the risk of political abuse of the data collected.

67. The objectives of such a national monitoring system should be:

(*a*) To monitor both the long-term effects of desertification on human well-being and those aspects of human behaviour which might contribute to desertification; included in this objective is the need to obtain information on the human condition indicating that desertification is indeed occurring (as requested by Recommendation 1);

(*b*) By obtaining early indicators, to minimize the impact and thus the human and economic costs of drought;

(*c*) By monitoring the human condition during a crisis, to maximize the benefit of relief programmes and to ensure that effective crisis-management mechanisms are maintained;

(*d*) To evaluate the effects of crises in order to use that information to help cope with similar future contingencies.

68. To implement this recommendation, it is further recommended that:

(*a*) Such monitoring be based on social indicators, relating both to gradual desertification and to crises, and that it forms an integral part of anti-desertification programmes;

(*b*) The data consist of indicators of basic needs, production and productivity, and selected physical conditions;

(*c*) Data collection techniques and initial tabulation processes be simple so that costs and implementation problems are minimized; it is recognized, however, that some countries may subsequently wish to submit the data to more complex analysis;

(*d*) Existing data and government agencies should be used whenever possible; in particular, recent censuses be exploited and analysed;

(*e*) In all countries concerned, one or more sample population units should be chosen for monitoring of the human condition;

(*f*) Urgent attention should be paid to the question of how monitoring information can be rapidly fed to and utilized by national policy-makers;

(*g*) Monitoring of the human condition should address at least the following variables and indicators as appropriate:

(i) Population;

(ii) Human and environmental health;

(iii) Food;

(iv) Human settlements;

(v) Education;

(vi) Socio-cultural patterns;

(vii) Man as a land user;

(viii) Production and productivity.

69. The human condition may be monitored by three different systems:

(*a*) Base-line measures obtained by utilizing existing information, by adding questions to censuses and by organizing special-purpose surveys;

(*b*) Simple and cheap but effective systems for giving advance warning, by the most appropriate means, of changes in the human condition, established by monitoring the chief migration streams to see if they show abnormal changes in magnitude or composition, or by taking periodic measures in selected representative areas;

(*c*) Crisis-monitoring of the human condition in major droughts, to be carried out along migration routes and at destinations (including refugee camps), and also by examining sample areas in drought-stricken regions from which the refugees originate.

70. Regional co-operation, through the existing regional mechanisms, including the United Nations regional commissions and intergovernmental bodies, is required in implementing this recommendation in order to:

(*a*) Establish a system for the continuous exchange of information gained from the national monitoring of the human condition among the countries of the regions concerned;

(*b*) Establish regional systems for monitoring, planning and directing population movements across political borders during drought disasters;

(*c*) Establish an experimental monitoring area in one or more countries of the region in order to elaborate and improve the suggested systems for monitoring the human condition, to make them consistent with the particular conditions of each of the regions concerned, and to disseminate the experience so gained among the countries of the region.

E. INSURANCE AGAINST THE RISK AND THE EFFECTS OF DROUGHT

Recommendation 17

71. As there is a particularly high risk of drought disaster in areas subject to desertification, the need for disaster relief and rehabilitation must be anticipated. It is recognized that the populations of areas prone to drought practise a wide range of strategies to protect themselves against the effects of drought.

Accordingly, it is important for official relief action to take account of these mechanisms and indeed to strengthen them, rather than ignore or damage them. If relief operations are carefully planned before the need arises, they will not only be more rapid and effective, but opportunities for social change created by disaster can be constructively used to promote programmes recommended in this Plan of Action. Explicit recognition of the risk of drought leads to insurance against the risk. Planning for disaster relief involves a set of financial and other measures to insure the inhabitants of the areas at risk against loss of crops, livestock, means of livelihood, housing and food supply.

It is recommended that the recommendation on drought loss management adopted by the United Nations Water Conference be noted and implemented. It is further recommended that preventive measures be taken and protective strategies adopted for effectively combating the risks and effects of drought, and that insurance schemes be adopted at the national level which are compatible with the socio-economic needs of the local people and the national interest in relation to the long-term protection of resources and the quality of the environment.

72. To implement this recommendation national action will be required to:

(*a*) Establish or reinforce crop and livestock insurance schemes, and savings and credit institutions designed for small farmers and livestock owners;

(*b*) Create food, fodder, fuel, and pastoral reserves against disaster, as well as reserves of seeds;

(*c*) Plan in advance for periods of less than normal precipitation;

(*d*) Investigate existing local risk-reduction and insurance mechanisms so that these may be strengthened and supplemented during crises and, where appropriate, incorporated in more permanent insurance schemes;

(*e*) Consider ways to maintain the purchasing power of dry land farmers and pastoralists during periods of drought so as to protect them against the effects of price instability, and organize pilot projects based on locally available resources;

(*f*) Establish national and provincial commissions to work toward agreements between farmers and pastoralists about the shared use of common lands and water supplies during periods of crisis;

(*g*) Provide for a portion of the proceeds of taxation, where taxation of livestock and other means of agricultural production exists, to be set aside for insurance purposes for the people subject to taxation;

(*h*) Establish food reserves within agricultural areas vulnerable to desertification, with due regard to factors of storage, transportation, distribution and management;

(*i*) Establish special forms of risk insurance for pastoralists, including: loans of breeding stock, including traditional exchanges; identification of reserve pasture areas, with appropriate management schemes; establishment, maintenance and improvement of permanent breeding stocks; establishment of emergency markets for disposal of surplus animals;

(*j*) Provide alternative forms of relief employment for people affected by drought, including the stockpiling of tools;

(*k*) Design essential services, such as water supply, transport, medical and veterinary services, to meet periodic drought crises;

(*l*) Consider the establishment of national insurance schemes, operating from suitably located centres, for people at risk, to assist them during periods of crisis.

73. Regional co-operation is required to facilitate the movement of people across national boundaries during crisis periods. As the temporary migration of people out of areas and countries suffering from severe drought conditions into less adversely affected areas represents a form of insurance against further loss, international efforts to facilitate these movements should be advanced. This recommendation also implies regional and international co-operation in evaluating remedial and disaster relief programmes with a view to their playing a greater role in ensuring improved water management, thereby improving the livelihood of people, preventing desertification, and reducing the impacts of drought.

F. STRENGTHENING SCIENCE AND TECHNOLOGY AT THE NATIONAL LEVEL

Recommendation 18

74. The lack of scientific and technological capability in many of the developing countries affected by desertification constitutes a serious obstacle to successful national campaigns against desertification. For this Plan of Action to be successful, scientific and technological capabilities must be strengthened, taking into account national, economic and social development plans. Although it is expected that detailed recommendations in this respect will be considered in 1979 by the United Nations Conference on Science and Technology, it is nevertheless appropriate to undertake certain measures, within the framework of the present Plan of Action, which could serve as an input to this later conference.

It is recommended that appropriate action be taken to utilize and strengthen national capabilities in science and technology, with particular attention to planning and management for rational utilization of resources, as part of the campaign against desertification, as well as to establish conditions which will lead to a more adequate international flow of technology to the developing countries.

75. The implementation of this recommendation calls for broad international support in the form of advice, technical and financial assistance, and training. This could be achieved by strengthening existing national institutions, through the mobilization of national and international resources, with the aid of agencies of the United Nations system and governmental and non-governmental organizations, including bilateral arrangements. National action would be required to:

(*a*) Establish, co-ordinate or strengthen national scientific institutions concerned with the problem of desertification so that they may assist in the transfer and modification of technology and in the dissemination of information on current progress in science and technology related to combating desertification;

(*b*) Give due attention to the modification of technologies to suit local conditions, taking into account social, cultural and economic factors, and ensuring a proper combination of local and imported technology;

(*c*) Provide advisory or extension services and training on the application of new or modified technologies, bearing in mind their impact on national technologies;

(*d*) Provide existing scientific and technological centres, including the universities and agricultural institutes, with the staff, equipment, material and funds necessary for their operation;

(*e*) Establish or reinforce with the help of international organizations, machinery for monitoring desertification (see Recommendation 11) and the human condition (see Recommendation 16);

(*f*) Promote the development of programmes to revive traditional techniques for combating desertification, complementing them with existing innovations, and encourage the exchange of these techniques among countries.

76. Regional action involving the United Nations regional commissions and other relevant bodies is required in connection with this recommendation to:

(*a*) Reinforce and support existing regional scientific institutions and programmes related to combating desertification, and promote, where necessary, the establishment of new scientific institutes in areas subjected to desertification;

(*b*) Support and strengthen the Institut du Sahel, the African Remote Sensing Council and any other similar institutions which may be established in the future;

(*c*) Support regional efforts to transfer technology.

Recommendation 19

77. The problem of energy sources is of the utmost importance in areas affected or likely to be affected by desertification. First of all, the collection of woody plants and the manufacture of charcoal are at present, and are likely to remain, the main sources of energy for many inhabitants of arid lands. Excessive wood cutting is among the most serious causes of desertification. If a substitute for woody fuel can be found in these areas, it will be a powerful factor in the improved management of vegetation resources, and hence a tool in combating desertification. Secondly, the use of alternative or unconventional energy sources in dry lands, usually favoured with sunlight and wind, should be vigorously investigated as a means of preserving organic materials, of reducing the tedious human labour so often involved in fuel collection, and of providing the people of the dry lands with simple, inexpensive and convenient devices to serve their daily lives. These unconventional energy resources could be based on solar, wind, biological, geothermal or other sources of energy. They could provide alternatives to burning wood for cooking, and supply water for drinking and irrigation and light for homes.

It is recommended that the conventional use of energy sources based on the use of vegetation be controlled and improved, that existing local or imported technologies for gas and electricity production, as well as for heating or cooling or mechanical purposes, be implemented as far as practicable, and that research be vigorously pursued into the use in the dry lands of alternative or unconventional energy sources that will yield simple, inexpensive, useful and socially acceptable devices to serve the needs of their people.

78. This recommendation implies national action to:

(*a*) Promote the controlled use of plant materials for fuel as part of conservational management, including the planting of woodlots, the establishment of forest reserves, the rotational collection of fuel and the introduction of improved woody species, encourage the use of various trees which grow rapidly and whose wood could be harvested easily, and develop and implement more efficient charcoal manufacture and energy conversion devices based on plants as fuel;

(*b*) Establish facilities for the local manufacture of simple and efficient devices shown by investigations to be useful alternative energy sources in the dry lands. The following devices could be recommended for quick national adaptive investigations and for experimentation in pilot projects, bearing in mind the need for improved transfer and coordination of information to minimize unnecessary and costly duplication of effort, as well as to facilitate the international sharing of presently available technology:

(i) *Solar energy:* photovoltaic or thermodynamic generators and water pumps based on them, water pumps combined with reverse osmosis desalters based on solar energy generators, water heaters, water distillers and desalters, cookers, coolers, food dryers, refrigerators;

(ii) *Wind energy:* windmill waterpumps, energy generators, and water pumps combined with reverse osmosis desalters;

(iii) *Biological energy:* bio-gas generators using animal waste, pyrolytic reactors designed to produce charcoal, gas and oil from agricultural wastes such as grain husks, peanut hulls, stalks of crop residue, palm leaves, etc.;

(iv) *Geothermal energy:* although this energy source is not yet operational, and concerns at present only certain volcanic regions of the world, it deserves to be investigated more thoroughly because of its future potential, as part of the fight against desertification, notably in the case of developing countries situated in arid and semi-arid zones;

(*c*) Establish distribution facilities to ensure that such devices reach the people who can use them, at a subsidized price when necessary and accompanied by instructions for use;

(*d*) Establish appropriate maintenance facilities, including the provision of necessary spare parts for the devices, to ensure their continuing exploitation;

(*e*) Ensure that women, who in countries affected by desertification are largely responsible for the collection and consumption of wood for fuel in their families, are consulted on the acceptability of any new devices introduced, trained in their management and encouraged to find alternative, productive uses for any time freed by their introduction.

Recommendation 20

79. The implementation of national programmes for monitoring, studying and combating desertification, and for rational management of resources in dry lands subject to desertification, requires various categories of trained scientists and technicians. Their training must take into full consideration the

complex and locally varying nature of the process of desertification and the need for integration of measures to combat it, to reclaim lost terrain, and to improve the quality of life for the inhabitants. The success of national plans and their efficient implementation depend on the conscious acceptance and positive participation of the societies concerned. It is desirable that national education programmes be available, and that these be based on a collaborative process involving the users of the land, local and national Governments, resource management specialists and educators. In the same manner, educational opportunities should be available at all levels of society--from the policy maker and resource manager to the student or local citizen. Furthermore, these educational programmes should be linked to national institutions for desertification research and management, so as to improve their relevance, facilitate the actual application of new ideas and research results, and provide training opportunities for students. These activities call for a variety of well co-ordinated mass-media programmes.

It is recommended that training, education and information related to desertification be accorded priority in national programmes, with due regard to the specific circumstances of the country concerned.

80. This recommendation calls for national action to:

(*a*) Provide for the inclusion, evaluation and modification of information on desertification and arid and semi-arid land processes in environmental programmes and curricula of education at all levels, including schools and universities;

(*b*) Provide courses and degree programmes in universities and institutes of higher studies, including postgraduate training in multi-disciplinary studies, to support national programmes for combating desertification and reclaiming desert lands;

(*c*) Provide special scientific and pedagogic courses related to the ecology of deserts and arid and semi-arid lands in teacher training programmes;

(*d*) Incorporate in the objectives of out-of-school educational programmes the mobilization of popular support for national programmes to combat desertification and reclaim arid lands. These educational programmes need to take prevalent socio-cultural factors into consideration with a view to fostering attitudes compatible with necessary changes, or gradually changing attitudes opposed to change, and to use languages and means of demonstration that are intelligible to the masses, and means of communication accessible to remote areas;

(*e*) Promote mass-media programmes that comprise continuous and mutually supportive activities, including radio, television, press, cinema, pamphlets, posters, etc.;

(*f*) Establish demonstration units where improved or new methodologies of land-use are practised. These units could organize demonstration and training programmes in which men and women engaged in farming, agriculture or pastoralism could participate for appropriate periods of time;

(*g*) Provide information on desertification processes to high-level decision-makers and civil servants in order to make it possible to carry out these and other relevant recommendations in the present Plan of Action.

81. The implementation of this recommendation implies regional co-operation, especially in regions

where one language or a common culture prevail, including:

(*a*) Exchange of experience in school and university educational programmes through, *inter alia*:

(i) Symposia on environmental education including desert aspects;

(ii) Short-term training on special research techniques (remote sensing, etc.);

(iii) Training courses for technicians;

(iv) Student exchange and internship programmes;

(*b*) Exchange of experience and information on media programmes through, *inter alia*:

(i) Seminars on ways and means of sensitizing land-users to problems of ecosystem degradation, including desertification;

(ii) Workshops for the production of model media materials (radio and television programmes, pamphlets, posters, etc.);

(iii) The establishment of appropriate machinery for exchange of media programmes and materials;

(*c*) Co-ordinated measures to establish or strengthen regional information, education and training centres dealing with the promotion of fundamental or applied scientific knowledge or with integrated methods for the logging, estimation, assessment, monitoring, management and rational use of resources. Such centres could be organized on the basis of those already in existence, by encouraging them to join together in a network within which they would be able to find interests and resources to their mutual satisfaction.

Recommendation 21

82. Desertification is often a national problem, and accordingly a strong national machinery is necessary to combat it. In many countries, activities to combat desertification are scattered among various ministries and departments, with no special arrangements to co-ordinate them. There may be overlap between a variety of bodies with responsibility for combating desertification and the planning and development of arid and semi-arid zones; on the other hand, important areas may not be covered at all. This constitutes an obstacle to technological progress and to the advance of measures for the recovery of areas subjected to desertification. In these circumstances it will be necessary to create national machinery for the elaboration and implementation of national programmes for combating desertification and to make specific budgetary allocations for carrying them out.

It is recommended that where none exists, co-ordinated national machinery to combat desertification and drought be established.

83. To implement this recommendation it would be desirable to establish a national desertification commission at the highest level of government, with high-ranking representatives of the appropriate ministries, agencies and institutes and community leaders and non-governmental organizations, or to assign the task of co-ordination to an appropriate national authority (ministry, department or board),

particularly to that responsible for environmental protection. The function of this national body would be to co-ordinate and consolidate activities related to desertification, rather than to impose a new administrative structure. Even so, this body must be administratively and scientifically supported by a small technical staff.

84. The responsibilities of such a national body might include:

(*a*) Analysis, evaluation and dissemination of existing information on desertification;

(*b*) Preparation of a national plan of action to combat desertification that would co-ordinate all national activities;

(*c*) Arranging for financing the implementation of the national plan of action through national institutions;

(*d*) Monitoring the progress of measures to combat desertification and recommending necessary changes to the national plan of action.

(*e*) Participation in international and regional programmes, and maintaining liaision with regional and international organizations on problems of desertification.

G. INTEGRATION OF ANTI-DESERTIFICATION PROGRAMMES INTO COMPREHENSIVE DEVELOPMENT PLANS

Recommendation 22

85. Immediate action is necessary in the areas most severely affected by desertification. At the same time, it would be advisable for individual Governments to formulate programmes to combat desertification in accordance with an integrated and comprehensive developmental plan capable of going beyond the limits of sectoral approaches.

Programmes to combat desertification should be formulated, whenever possible, in accordance with the guidelines of comprehensive development plans at the national level.

86. The implementation of this recommendation requires a set of actions on the part of individual Governments, including the formulation of comprehensive development plans where they do not yet exist, taking into account the specific problems of desertification. To this end, appropriate United Nations technical assistance should be provided whenever requested by interested Governments.

V. Recommendations for international action and co-operation

A. INTERNATIONAL ACTION

87. As the implementation of the Plan of Action to Combat Desertification is expected to be carried out by Governments through their national institutions with international support (see para. 17 above), there must be close co-ordination of national, regional and international programmes in a general campaign against desertification.

Recommendation 23

88. The services of the agencies of the United Nations system should be available, and their participation in the implementation of the Plan of Action must be ensured. The agencies of the United Nations system, in their respective fields of competence within the scope of the Plan of Action, should elaborate methodologies, co-ordinate and support scientific and technological research, facilitate the exchange of information, and provide financial and technical support for the implementation of the recommendations outlined in this Plan of Action.

It is recommended that the General Assembly request the Secretary-General of the United Nations and the governing bodies of the United Nations Development Programme, the United Nations Environment Programme, the United Nations Industrial Development Organization, the United Nations Conference on Trade and Development and the United Nations regional commissions, and invite the governing bodies of the Food and Agriculture Organization of the United Nations, the World Meteorological Organization, the United Nations Educational, Scientific and Cultural Organization, the World Health Organization, the International Bank for Reconstruction and Development and other relevant United Nations bodies, to support, in their respective fields, international action to combat desertification in the context of the present Plan of Action, and to make appropriate provisions and allocations in their programmes.

89. The implementation of this recommendation requires a set of actions by the agencies concerned, including:

(*a*) Review and evaluation of current activities related to the problems of arid zones, and to the problems of desertification in particular, with a view to adjusting and co-ordinating these activities to conform with the Plan of Action. The revision should be conducted in close co-operation with the United Nations body entrusted by the General Assembly with the task of co-ordination and follow-up, on the recommendation of the United Nations Conference on Desertification. Priority should be given to the application of existing knowledge and to ensuring that on-going and planned activities are sufficiently financed;

(*b*) Planning of advisory, financial and technical support for the Plan of Action, including support from their existing budgets in the following fields:

(i) The elaboration of a uniform methodology for the assessment, monitoring and prognosis of desertification;

(ii) Making available to Governments, on request, consulting services and technical assistance in:

(1) Organizing systems for monitoring desertification;

(2) Collecting, processing, analysing and evaluating data;

(3) Land-use planning;

(4) Education on dryland environment and desertification, especially through mass-education programmes;

(5) Implementing, on a continuing basis, the recommendations of the United Nations Water Conference relevant to the problems of

desertification;

(6) Formulating national action programmes and policies for improved soil and water management;

(7) Organizing training courses in soil and water management at national and regional centres strengthened for this purpose with international support;

(8) Improving livestock, wildlife and rangeland management;

(9) Training farmers in improved techniques for rain-fed farming, particularly by strengthening the services for extension and on-farm training;

(10) Improved and appropriate technology in irrigated agriculture; United Nations bodies now concerned with irrigation agriculture should be geared and co-ordinated to provide advice on the planning, design and construction of irrigation systems, the reclamation of waterlogged, salinized and alkalinized lands, the investigation and monitoring of soil-salt-water relations, and the control of water-related diseases;

(11) Revegetation and afforestation in dry lands, as well as the stabilization of sand dunes;

(12) Problems related to migration from dry lands and the resettlement of migrants;

(13) Family planning and family health;

(14) Planning and research on human settlements;

(iii) Providing technical assistance to Governments, on request, for the establishment, expansion and improvement of networks of meteorological and hydrological stations in areas subject to desertification;

(iv) Compiling, publishing and distributing a desertification atlas containing appropriate thematic maps at an adequate scale; such an atlas should be periodically revised;

(v) Promoting the establishment of dry land biosphere reserves to preserve natural ecosystems, as well as genetic diversity, and to provide baselines for monitoring;

(vi) Organizing the training of land-use planners and survey specialists at existing training centres, with the assistance of the United Nations University;

(vii) Working out and distributing to Governments, on request, a methodology for land-use planning in dry lands;

(viii) Undertaking comparative studies of existing laws and regulations, by institutions concerned with the legal aspects of natural resources, including land and water, and developing guidelines for legislation;

(ix) Standardization of methodologies and parameters for water survey and water development schemes, and organization of the international exchange of data and information relating to problems of improved water management in areas affected or likely to be affected by desertification;

(x) Developing comparable methods for the evaluation and study of surface and underground water resources, including an assessment of quality and quantity of water and the sources and extent of their recharge;

(xi) Developing interdisciplinary research and pilot projects with a view to promoting the rational management of arid and semi-arid rangelands, dry-land farming, and irrigated agricultural systems, including all socioeconomic, health and human aspects;

(xii) Encouraging all countries to make available, through the International Referral System for sources of environmental information (IRS) and other appropriate international services, relevant methodologies for:

(1) Assessing carrying capacities and appropriate stocking rates of natural rangelands and improved pastures, taking into account seasonal and interannual variation and drought risk;

(2) Determining the optimum size of agricultural units, and the size and composition of herds, in accordance with the characteristics and carrying capacity of the grazing land and existing land-use systems;

(3) Planning and carrying out rotational and deferred grazing;

(4) Planning and carrying out the ecological and geographical stratification of livestock breeding, fattening and marketing;

(xiii) Developing appropriate recommendations for the use of improved fertilizers in dryland farming, with special emphasis on organic manures and biological fertilizers that improve soil properties;

(xiv) Initiating a co-ordinated international programme to study wind and water erosion and to elaborate a comprehensive system for surveying, monitoring, predicting and combating soil erosion;

(xv) Organizing, through existing institutions, international postgraduate courses on methods to combat soil salinization and alkalinization;

(xvi) Providing financial and technical assistance for the implementation of projects on the improvement of irrigated agriculture to achieve the goals and targets set by the World Food Conference;

(xvii) Providing financial and technical support to programmes designed to ease the transition of dryland rural migrants into urban areas and the sedentarization of nomads;

(xviii) Providing financial and technical support to programmes designed to deliver health care to peoples living in areas affected or likely to be affected by desertification;

(xix) Providing financial and technical support to programmes for the development of proper human settlements in areas subject to desertification;

(xx) Reviewing the activities of disaster relief organizations with a view to further increasing their effectiveness, taking into account the present Plan of Action (1978-1979);

(xxi) Carrying out research into the use of alternative energy sources, especially wind and solar energy, in the dry lands; such research should be keyed to producing, testing, and publicizing simple, inexpensive and efficient devices for the use of dryland peoples;

(xxii) Organizing, in the Union of Soviet Socialist Republics, international seminar courses for higher level specialists on:

(1) Watering and irrigation in arid areas;

(2) Rational use of pastureland;

(3) Forestry in desert areas (including forest improvement and stabilization of shifting sand);

(*c*) Taking account, in the course of international negotiations involving commodities, trade and development, of the special risks involved for people in desert-prone areas;

(*d*) Co-operation with the Environment Coordination Board to prevent overlapping and duplication of effort, with attention, in the case of water problems, to the International Hydrological Programme of UNESCO and the Operational Hydrological Programme of the World Meteorological Organization and, in the case of the problems of arid and semi-arid rangelands, projects 3 and 4 of the MAB Programme, the UNESCO/UNEP Integrated Project on Arid Lands (IPAL), and the FAO/UNEP EMASAR Programme.

Recommendation 24

90. It is evident that climate plays a critical role in most desertification processes, and the need for improving man's understanding of the causes of climate change and development of improved methods of climate prediction is widely accepted. It is also recognized that man's commercial, industrial, and agricultural activities have the potential for causing climate changes, and that there is a need to understand the consequences of man's activities. WMO, in association with UNEP, FAO, UNESCO, the World Health Organization (WHO) and the International Council of Scientific Unions (ICSU), has initiated planning for a world climate programme to address the full range of climate problems, including the study of the impact of climatic variations on the natural environment and human activities.

WMO, in association with other agencies of the United Nations and ICSU, is also planning to convene a World Climate Conference in 1979 in Geneva and, in collaboration with ICSU, is planning a broad research effort into the dynamics of climate. As part of the Global Atmospheric Research Programme, WMO will in 1978 and 1979 be conducting the first Global Weather Experiment to provide the necessary data base for initiating the study of interannual climatic variations. The successful planning and execution of the already agreed World Climate Programme, the World Climate Conference, and the Global Atmospheric Research Programme can provide vital information, understanding, and climatic services required by Governments to cope with the process of desertification.

It is recommended that the General Assembly of the United Nations endorse the activities of the World Meteorological Organization, the International Council of Scientific Unions, and interested United Nations agencies that are directed at understanding and resolving climate problems, and that it urge Governments, international agencies, and other interested bodies to support and participate in the planning and execution of the World Climate Programme, the World Climate Conference, and the Global Atmospheric Research Programme.

Recommendation 25

91. The participation of international and regional organizations outside the United Nations system, both intergovernmental and non-governmental, will be an important factor in the successful implementation of the Plan of Action.

It is recommended that the United Nations General Assembly should request the Secretary-General to invite intergovernmental and nongovernmental organizations concerned with desertification problems and their impact on development to participate in the implementation of the Plan of Action to Combat Desertification with a view to co-ordinating their activities within a worldwide programme.

92. To implement this recommendation, such organizations may find it necessary to increase their efforts to raise the resources necessary for the financing of technical co-operation programmes and research projects related to the development of plans for, and the strengthening of institutions engaged in, combating desertification.

B. INTERNATIONAL CO-OPERATION

Recommendation 26

93. Experience has shown that processes of desertification at times transcend national boundaries, making efficient regional co-operation essential in the management of shared resources, with the objective of preventing ecological imbalance which can cause desertification.

In order to achieve judicious management and equitable sharing of resources on the basis of equality, sovereignty and territorial integrity, it is recommended that countries concerned should co-operate in the sound and judicious management of shared water resources as a means of combating desertification effectively.

94. In this connection, the Conference on Desertification reaffirms the recommendation of the United Nations Water Conference that in the absence of bilateral or multilateral agreements, Member States should continue to apply generally accepted principles of international law in the use, development and management of shared water resources.

95. The work of the International Law Commission in its contribution to the progressive development of international law and its codification of the law of the non-navigational uses of international watercourses should be given higher priority in the work programme of the Commission, and should be coordinated with activities of other international bodies dealing with the development of the international law of waters with a view to the early conclusion of an international convention.

VI. Recommendations for immediate initial action

96. A number of actions should be undertaken immediately upon the adoption by the Conference of the Plan of Action to Combat Desertification and its subsequent endorsement by the General Assembly as the United Nations Plan of Action. These actions could be undertaken at the national level by the Governments themselves, if they so wish; they should be undertaken at the regional level by the regional United Nations bodies and relevant intergovernmental organizations, and at the international level by the body designated for this task by the General Assembly.

97. At the national level, Governments may wish to consider the following immediate actions:

(*a*) Establishment or designation of a governmental authority to combat desertification (see Recommendation 21);

(*b*) Assessment of desertification problems at country and provincial or sub-provincial levels (see Recommendation 11);

(*c*) Establishment of national priorities for actions against desertification;

(*d*) Preparation of a national plan of action against desertification within the scope of the United Nations Plan of Action to Combat Desertification;

(*e*) Selection among national priorities of those actions which could be taken:

(i) Nationally;

(ii) With the support of regional or international organizations or other foreign sources;

(iii) In the framework of regional or international co-operation;

(iv) Only with foreign aid;

(*f*) Preparation and submission of requests for international support for specific activities within the above priorities, as required;

(*g*) Implementation of actions in accordance with national plans to combat desertification.

98. At the regional level, the United Nations regional commissions, as well as relevant intergovernmental and non-governmental organizations, may, in consultation with the countries concerned, wish to come forward with regional plans or specific proposals for the implementation of the Plan of Action to Combat Desertification. These plans or proposals should be co-ordinated at the international level to avoid any duplication of activities. They may include *inter alia* the following immediate post-Conference actions at the regional level:

(*a*) The convening of regional post-Conference technical workshops or seminars by the United Nations regional commissions, in co-operation with the regional organizations and Governments concerned, to discuss the implementation of the Plan at the regional level and to define regional programmes more precisely;

(*b*) inter-regional consultations and studies on selecting sites for the establishment of the regional centres proposed in paragraph 99 (*e*) below;

(*c*) Organizing and co-ordinating the implementation of the transnational regional projects outlined in the feasibility studies on the major regional aquifers of North-East Africa and the Arabian Peninsula (A/CONF.74/24), the "green belt" in North Africa (A/CONF.74/25), the transnational development of grazing resources in the Sudano-Sahelian regions (A/CONF.74/26), regional monitoring of desertification processes in South-West Asia and South America (A/CONF.74/27-28), and vegetation restoration in the Sahelian belt (A/CONF.74/29). The following steps might be successively undertaken in the course of implementation:

(i) Arranging for the receipt of any outstanding approval by Governments as to the feasibility of the projects;

(ii) Undertaking the necessary institutional arrangements;

(iii) Conduct of pre-investment studies;

(iv) Formulation and design of the projects;

(v) Approval of the projects by the countries concerned;

(vi) Execution of the projects;

(vii) Monitoring of the results of the projects.

99. At the international level, the body designated by the General Assembly for implementing the plan of action to combat desertification should undertake the following immediate steps:

(*a*) Request the agencies and organizations of the United Nations family to actively associate themselves with the implementation of relevant parts of the plan of action to combat desertification;

(*b*) Request the Governments concerned to put forward their needs for international support for their own national action against desertification, in accordance with the provisions of paragraph 97 (*e*) and (*f*) above;

(*c*) Upon receiving replies from the agencies and corresponding requests from the Governments concerned, undertake the necessary joint programming in order to formulate, in implementation of the Plan of Action to Combat Desertification, specific actions in the following categories:

(i) Capital investment programmes and projects;

(ii) Pilot and demonstration projects;

(iii) Feasibility studies;

(iv) Training;

(v) Monitoring;

(vi) Insurance for peoples at risk;

(vii) Services: technical, consultative, etc.;

(viii) Research: centres, project co-ordination, etc.;

(ix) Ad hoc working groups;

(x) Seminars, workshops, meetings, and other arrangements for the exchange of information and experience;

(*d*) Undertake the necessary steps to mobilize financial resources;

(*e*) Arrange for, and where necessary co-ordinate the preparation of, a programme of work, designs of specific projects and strategies for financing and implementing anti-desertification programmes, including:

(i) The conduct, in consultation with interested Governments, and on the basis of the Plan of Action and suggestions made at the post-Conference regional meetings, of an analysis of the need for strengthened or new integrated regional antidesertification research and training centres, and the provision of assistance in carrying out whatever measures are required;

(ii) The establishment of regional networks of biosphere reserves by upgrading national reserves selected to achieve a representative range of environments and genotypes. Management of the reserves should be co-ordinated at the regional level in conjunction with regional centres for remote sensing, and the reserves could serve as baseline stations for monitoring desertification and training the necessary specialists;

(iii) The preparation, publication and distribution by UNEP, in co-operation with relevant United Nations bodies, of teaching and management manuals on the following specific topics of anti-desertification technology and management:

(1) The control of water and wind erosion;

(2) The stabilization and utilization of shifting sands;

(3) Principles of dry farming;

(4) Principles of irrigated agriculture;

(5) The amelioration and irrigation of saline and alkaline soils;

(6) The use of brackish water for irrigation;

(7) Rangeland and livestock management;

(8) Methods of arid land afforestation;

(9) The assessment of water resources;

(iv) The preparation, publication and distribution by FAO, in co-operation with UNEP, UNESCO and WMO, of a Desertification Map of the World at a scale of 1:5,000,000, based on the experience gained and the methodology developed in the course of the preparations for the Conference, and in close co-operation with Governments and the national and regional institutions concerned; this map should be accompanied by a comprehensive explanatory text following the example of the 1:5,000,000 World Soil Map published by FAO/UNESCO;

(v) The preparation, publication and distribution by UNEP, in co-operation with relevant United Nations bodies and other international governmental and non-governmental organizations, of an updated annotated directory of international, regional and national organizations, institutes, research centres, experimental stations, etc., which are dealing with the problems of desertification and the development of arid lands.

100. The above recommendations for immediate action should not be considered as a substitute for the major actions against desertification recommended elsewhere in the Plan of Action. It constitutes only the initial stage of what needs to be done. Implementation of the Plan in its entirety is the only real answer to the problem of desertification, and, if successfully carried out, will enable mankind to advance further on the way to a new international economic order and to a better life for all.

VII. Recommendations for implementation of the Plan

Recommendation 27

101. One of the basic premises of the United Nations Conference on Desertification, and of the various General Assembly and related resolutions and decisions that have led to the Conference, is that desertification is a global problem, requiring a focus which has hitherto been lacking. Although many disciplines touch on the process of desertification and many international institutions, including those of the United Nations system, deal with the problems of combating desertification, it is evident that an antidesertification programme requires an interdisciplinary, interagency and intra-regional approach. Thus, while the various members of the United Nations family and other intergovernmental bodies and bilateral and multilateral programmes deal with certain aspects of development in arid lands, none of them is concerned primarily with desertification. A focus is needed that can draw together existing institutional endeavour and administrative machinery and mobilize the resources required to carry out the Plan of Action. At the same time, it is evident that no new institution in the United Nations system is needed to carry out the work.

It is recommended that the United Nations Environment Programme, with its Governing Council and the Environment Co-ordination Board[1] should be responsible for following

up and co-ordinating the implementation of the Plan of Action to Combat Desertification. It is further recommended that the regional commissions of the United Nations have responsibility for co-ordinating, catalysing and executing[2] intra-regional programmes adopted by the member States concerned. It is also recommended that with respect to co-ordination and implementation of programmes to combat desertification, the regional commissions should actively participate in the Environment Co-ordination Board.

102. To carry out this recommendation:

(*a*) The Governing Council of UNEP should:

(i) Promote and encourage international cooperation in the field of desertification and recommend, as appropriate, policies to this end;

(ii) Provide general policy guidance for the direction and co-ordination of desertification programmes within the United Nations system;

(iii) Submit progress reports annually and complete reports biennially to the General Assembly, through the Economic and Social Council, on the implementation of the Plan of Action;

(*b*) The Executive Director of UNEP should:

(i) Under the guidance of the Governing Council, co-ordinate desertification programmes within the United Nations system, keep under review their implementation and assess their effectiveness;

(ii) Advise, as appropriate and under the guidance of the Governing Council, intergovernmental bodies of the United Nations system on the implementation of the Plan of Action to Combat Desertification;

(iii) Secure the effective co-operation of, and contributions from, relevant scientific and other professional communities in all parts of the world;

(iv) Report annually on desertification matters to the Governing Council;

(*c*) The Environment Co-ordination Board should:

(i) Ensure co-operation and co-ordination among all organs of the United Nations system concerned with the implementation of the Plan, and submit progress reports annually and complete reports biennially to the Governing Council of UNEP;

(ii) Establish a working group on desertification consisting of a small number of highly qualified officers from appropriate United Nations agencies and bodies, within the framework of existing budgets, according to the Institutional and financial arrangements for international environmental cooperation, to assist the Board in carrying out its task in the field of desertification;

(*d*) The regional commissions of the United Nations should, in carrying out their tasks,

work in close contact with the regional offices of UNEP as well as with governmental and non-governmental organizations and institutions at the national and regional levels which are of relevance in combating desertification.

103. To carry out their tasks, the Executive Director of UNEP and the Environment Co-ordination Board should be serviced by a very small number of highly qualified staff, who would be clearly identifiable within the UNEP secretariat and drawn from the various United Nations agencies concerned. It could also draw on consultants and institutions primarily in the affected area or areas likely to be affected by desertification. The functions of this staff could include, under the guidance of the Environment Coordination Board and its Working Group on Desertification, the following:

(*a*) To keep a continuous inventory of all needed programmes and projects, as well as present or planned activities dealing specifically with the control and, where possible, reversal of desertification. The purposes of this inventory are to identify gaps which require new financing and to determine which projects and programmes are concerned specifically with desertification as opposed to short-term remedial measures designed to assist in coping with the effects of recurrent drought;

(*b*) To prepare or help to arrange preliminary surveys and technico-economic feasibility studies as a basis for formulating projects and programmes for the implementation of the Plan of Action, in a form which can be presented to sources of financing;

(*c*) To prepare alternative proposals for the mobilization of the necessary capital to finance programmes and projects specifically aimed at combating desertification, including the servicing of regional or global consortia when established;

(*d*) To monitor the implementation of the Plan of Action and to prepare evaluations of its effectiveness;

(*e*) To record the results of the monitoring of desertification through contacts with various monitoring systems (e.g. the Global Environmental Monitoring System);

(*f*) To record the results of monitoring of the human condition in areas prone to desertification, including demographic and social indicators such as population movements and trends, with a view to monitoring the long-term effects of desertification, and existing or proposed schemes of insurance for people at risk;

(*g*) 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.

Recommendation 28

104. The work arising from the Plan of Action is a responsibility of the United Nations system as a whole, and affects projects and programmes of its specialized agencies. The continuous application of the collective knowledge and experience of the United Nations and the specialized agencies is also needed if the Plan of Action is to be effectively implemented within the given time. With this consideration in mind, the activities of the very small staff might be financed from existing funds.

The following forms of financing are recommended for consideration:

(a) *Subregional co-operation*

When so required, subregional co-operation should be initiated or intensified among groups of countries like the Organization of American States and individual countries affected by desertification with a view to formulating other specific joint programmes and development assistance requests. Subregional groups may wish to invite donor representatives to participate in these efforts. UNEP should assist these subregional groups with technical expertise, and relate their proposed programmes to the implementation of the global Plan of Action.

(b) *Bilateral, multilateral and multi-bilateral assistance.*

The traditional sources of financing, multilateral and bilateral assistance programmes, as well as the "multi-bilateral" approach, are effective, and, in view of the new development assistance needs highlighted by the Conference, should increase their assistance to countries suffering from desertification.

Developing countries should give due priority to desertification problems in their development assistance requests. The existing financial institutions within the United Nations system, as well as multilateral and bilateral donors outside the system should allocate part of their resources to finance activities advocated in the plan of action to combat desertification. To this end, a review of priorities and the activities of those institutions, particularly those within the United Nations system, should be undertaken without delay.

(c) *Consultative group/club or group-type financing*

The Executive Director of UNEP should, immediately after the adoption by the General Assembly of the Plan of Action, convene a consultative group comprising representatives from organizations referred to in paragraph 102 (*c*) (ii) above, from such other organizations as might be required, including major donors, both traditional and new, and multilateral financing agencies, and from developing countries having a substantial interest in combating desertification. The group, which would meet as and when required, would also assist in the co-ordination of activities undertaken with the resources mobilized by it. It would be serviced by the staff mentioned in paragraph 103 above, which should include persons with professional competence to deal with financial and related matters.

(d) *Special account*

The General Assembly should be invited to take the necessary steps for the creation, at the global level within the United Nations, of a special account for implementing the Plan of Action, which should draw its resources from, *inter alia*, contributions from Member States, international taxation, donations, multilateral financing institutions and from interest-free loans.

(e) *Additional measures*

The General Assembly should be invited to request the Governing Council of UNEP to have prepared, by a small group of high level specialists in international financing of projects and programmes, a study of additional measures and means of financing for the implementation of the Plan of Action as adopted by the Conference, such as funds in trust,

fiscal measures entailing automaticity, and an international fund, and to submit a final report on the subject of additional measures of financing to the General Assembly at its thirty-third session, through the Economic and Social Council.

C. RESOLUTIONS ADOPTED BY THE CONFERENCE

1. Implementation of General Assembly resolution 3337 (XXIX)

The United Nations Conference on Desertification,

Recalling that in resolution 3202 (S-VI) of 1 May 1974 the General Assembly recommended that the international community urgently take concrete measures to stem the spread of deserts and to assist the developing countries affected by the phenomenon to ensure the economic development of the areas affected,

Recalling that in its resolution 3337 (XXIX) of 17 December 1974 the General Assembly decided to convene the Conference to give impetus to the international action to combat desertification,

Recalling further that in the same resolution the General Assembly, recognizing the urgent need to institute a world-wide programme to seek solutions to the problems associated with desertification, and expressing the conviction that work in this field should be carried out at the national, regional and global levels, stressed that the Conference, and the preparations for it, should provide the international community with the basis for launching an action-oriented, comprehensive and co-ordinated plan of action with a view to resolving the problems of desertification,

Recalling also that in paragraph 4 of the same resolution the General Assembly requested the Secretary-General, in co-operation with the United Nations bodies concerned and with the assistance of an ad hoc interagency task force,

(*a*) To prepare a world map of areas affected and areas likely to be affected by the process of desertification;

(*b*) To assess all available data and information on desertification and its consequences on the development process of the countries affected;

(*c*) To prepare an effective, comprehensive and co-ordinated action programme against desertification, including the building-up of the indigenous and autonomous science and technology capacity,

Having examined the world map of desertification[*1*] presented to the Conference in accordance with the above-mentioned request of the General Assembly, with accompanying brochure,

Having considered the draft plan of action to combat desertification[*2*] submitted by the Secretary-General of the Conference in pursuance of paragraph 4 (*c*) of General Assembly resolution 3337 (XXIX), together with the proposals and amendments thereto submitted at the Conference, and having adopted, as amended, the recommendations contained therein for national, regional and international action,

I. *Assessment of all available data*

1. *Takes note with appreciation* of the high scientific caliber of the documentation assembled for the United Nations Conference on Desertification, which constitutes the most up-to-date collection and assessment of available data on desertification and its consequences;

2. *Further notes* the opinion of scientists that, although scientific and technological gaps still exist, man already possesses adequate knowledge and the economic and technical means to bring the advance of desertification to a halt, provided there is the requisite fusion of political will and professional skill;

3. *Recommends* to the General Assembly that it request the Secretary-General to transmit the main and background documents prepared for the Conference on the causes and processes of desertification to the organizations and bodies concerned within the United Nations system, as well as to the relevant scientific institutions outside the system, both governmental and non-governmental, for further research and development and refinement of the data, to close any existing gaps in scientific knowledge and technology, having regard in particular to the necessity of building an indigenous and autonomous science and technology capacity in the areas concerned;

4. *Considers* that, while awaiting the results of further research, national, regional and international measures to halt and reverse desertification should be taken immediately in view of the extreme urgency and human significance of the problem;

II. *World map of desertification*

1. *Recommends* to the General Assembly that it request the Secretary-General to transmit the world map of desertification to States Members of the United Nations and to competent organizations and bodies within the United Nations system, as well as to the scientific institutions concerned outside the system, both governmental and non-governmental, for further development of the map on the basis of the relevant recommendations of the United Nations Conference on Desertification[*1*] and taking into account the technical comments thereon made at the Conference:

(*a*) That in the definitions used as a basis for preparing the map the question of hydrological quandary, which is an important element to be included in a global map, was not taken into consideration;

(*b*) That the world map should be combined with the global map of soil degradation under preparation by the Food and Agriculture Organization of the United Nations, so as to be able to include humid areas;

(*c*) That since desertification is a dynamic process, there is a need for a map, or maps, or an atlas, on a large scale;

(*d*) That consideration should be given to receiving from national sources relevant data which can be systematically collected for improving the map;

(*e*) That a world map of desertification at a scale of 1:5 million and/or an atlas on desertification should be prepared, as the present scale of 1:25 million is too small to be dynamic;

(*f*) That the world map does not show the process of desertification, but only desertification hazards, and should therefore logically be called a world map of desertification hazards;

2. *Considers:*

(*a*) That the world map of desertification should be accepted as a first approximation primarily intended to indicate the global magnitude of the problem;

(*b*) That the inevitable limitations which the map, in its first form, contained, should be recognized, and that, in the light of the views of the Conference regarding the scope of desertification, the production at regional and national levels of detailed maps at larger scales, using the same legend or other appropriate legends, should be encouraged;

(*c*) That the production of other accompanying maps, for example of areas liable to salinization, alkalinization, hydrological quandary, seasonal drought, etc., should be encouraged;

III. *Plan of Action to Combat Desertification*

1. *Commends* the Secretary-General of the United Nations Conference on Desertification and the Conference secretariat for the thorough preparation and the relevance and excellence of the draft plan of action presented to the Conference.

2. *Approves* the Plan of Action to Combat Desertification for inclusion in its report[*1*] and commends the recommendations contained therein for necessary action, as appropriate, to all Governments, the General Assembly and all organizations and bodies within the United Nations system, at the regional and international levels, as well as to other concerned regional and international intergovernmental and non-governmental organizations;

3. *Strongly urges* that the necessary financial and other resources for the implementation of these recommendations be made available, so that they may be effectively implemented by all concerned.

17th plenary meeting

9 September 1977

2. *Financial and technical assistance to the least developed countries*

The United Nations Conference on Desertification,

Bearing in mind that the General Assembly, in resolution 3337 (XXIX) of 17 December 1974, decided to convene a United Nations Conference on Desertification in 1977,

Recognizing that desertification processes constitute a global human and social problem, as indicated in Desertification: an overview and in the Plan of Action to Combat Desertification,

Conscious of the fact that a number of developing countries and their limited resources, in particular the least developed countries, are confronted with special economic and social problems, and encounter the threat of desertification,

Emphasizing their conviction to the principle of sovereignty of States over their natural resources,

Recalling resolution 98 (IV) of the United Nations Conference on Trade and Development,

1. *Urges* the United Nations, the specialized agencies and international and regional financial institutions to extend, in addition to the current international and bilateral assistance, appropriate technical and financial assistance to the least developed countries for the purpose of enabling them to combat desertification effectively, as indicated in the Plan of Action to Combat Desertification;

2. *Recommends* to the General Assembly that it request the Secretary-General to report on the implementation of this resolution to the General Assembly at its thirty-third session.

17th plenary meeting

9 September 1977

3. *Drought in the Sahelian countries*

The United Nations Conference on Desertification,

Considering that during the current rainy season the Sahelian countries have once again had particularly low rainfall,

Considering that the brevity of the rainy season is such that those countries can no longer hope to obtain satisfactory harvests, and especially not harvests of cereals which will assure them of being able to feed their human and animal populations,

Considering that, since the emergency assistance currently being given to those countries cannot be an end in itself or a solution, an answer must be found to their problems which will be lasting and provide them with a permanent guarantee of adequate agricultural output,

1. *Draws the attention* of the international community to the critical situation prevailing throughout the Sahelian zone;

2. *Recommends* that increased aid be given to all Sahelian countries, which are once again stricken by drought;

3. *Recommends*, in view of the particular hardships to which those countries are subject, that everything possible be done to achieve the immediate implementation of the Plan of Action to Combat Desertification, in order to combat desertification in the subregion.

15th plenary meeting

8 September 1977

4. ***Effect of weapons of mass destruction on ecosystems***

The United Nations Conference on Desertification,

Recalling the comments in *Desertification: an overview*[*1*] and in the report of the preparatory meeting for the United Nations Conference on Desertification held at Nairobi from 12 to 16 April 1977[*2*] on desertification resulting from war,

Recalling General Assembly resolutions 31/64 and 31/65 of 10 December 1976,

Recalling inter alia the Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare, signed at Geneva on 17 June 1925,[*3*] and the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction,[*4*]

Recalling the ongoing discussions of the Conference of the Committee on Disarmament to achieve the prohibition of the development, production, and stockpiling of chemical weapons,

Considering that the protection of ecosystems and of the biosphere should be one of the major concerns of mankind,

Considering further that the development of technology and modern techniques places at the disposal of mankind dangerous means for the mass destruction of ecosystems,

Noting that the use of chemical and biological weapons during wars has been one of the factors contributing to desertification in certain parts of the world and that these factors are most seriously felt in developing countries including those which are currently engaged in armed struggle for independence and those which have recently achieved independence through armed struggle,

1. *Condemns* the use of any techniques that cause the destruction of the environment;

2. *Denounces* the effects of destructive weapons and practices on the ecosystems of all countries which have suffered them, and particularly developing countries, including those which are currently engaged in the struggle for independence and those which have recently achieved independence through armed struggle;

3. *Condemns* further the use of chemical and biological weapons which destroy or diminish the potential of ecosystems and are conducive to desertification;

4. *Condemns*, and demands the prohibition of, the use of poisons in water as a weapon of war;

5. *Appeals* to all States members of the organizations of the United Nations system to refrain from using or supplying to those who support this policy of destruction, arms or chemical products for military use that have a widespread, long-lasting or severe effect on the environment;

6. *Requests* the Secretary-General to report on the implementation of the present resolution to the General Assembly.

16th plenary meeting

9 September 1977

5. ***Colonial desertification practices***

The United Nations Conference on Desertification,

Recalling the General Assembly resolutions on apartheid,

Recalling also the international community's condemnation of the creation of bantustans,[*5*]

Recalling, lastly, the views expressed by delegations during the Conference[*6*] on colonial practices that destroy the ecosystems of countries struggling for their independence,

Decides:

(*a*) To condemn the policy of bantustanization, which, by grouping together in restricted areas of poor land the very great majority of the black population of South Africa, gives rise to excessive pressure on that land, which is a very serious factor in desertification and degradation of the environment;

(*b*) To request the States members of the organizations of the United Nations system to undertake international action in the immediate future with a view to prohibiting the continuation of this policy;

(*c*) To appeal to all States members of the organizations of the United Nations system to refrain from recognizing the bantustans.

16th plenary meeting

9 September 1977

6. ***Namibia: desertification***

The United Nations Conference on Desertification,

Recalling resolution 2145 (XXI) of 27 October 1966 by which the General Assembly terminated the mandate of South Africa over South West Africa, now known as Namibia,

Recalling further resolution 2248 (S-V) of 19 May 1967 by which the General Assembly established the United Nations Council for Namibia as the legal administering authority of Namibia until independence,

Bearing in mind the subsequent resolutions of both the General Assembly and the Security Council relating to the question of Namibia, in particular Security Council resolution 385 (1976),

1. *Condemns* the continued illegal occupation of the territory of Namibia by South Africa;

2. *Recognizes* that proper implementation in Namibia of the Plan of Action to Combat Desertification will not be possible until the illegal occupation by South Africa has been

terminated and Namibia has achieved independence.

13th plenary meeting

7 September 1977

7. ***Associated case study "The Negev: a desert reclaimed"***

The United Nations Conference on Desertification,

Considering that the Conference is solely directed to the problems of desertification,

Conscious of the necessity to examine all climatical, ecological, human and social factors leading to desertification,

Having taken cognizance of all documents presented to the Conference,

Considering that the associated case study *The Negev: a desert reclaimed*,[*1*] presented by Israel, departs from scientific and technical issues related to the Conference in that it expresses religious fanaticism and contains elements which are historically inaccurate,

Considering also that the said document is not in conformity with the aims and purposes of the Conference as outlined in General Assembly resolution 3337 (XXIX) of 17 December 1974,

Considering that the policies of settlement and displacement of populations in the Negev, in the West Bank of the Jordan, and in other places in the area constitute an aggravating factor leading to desertification,

Denounces the associated case study *The Negev: a desert reclaimed.*

15th plenary meeting

8 September 1977

8. ***Expression of thanks***

The United Nations Conference on Desertification,

Recognizing the need for concerted international action to combat desertification,

Convinced that the United Nations Conference on Desertification which took place at Nairobi from 29 August to 9 September 1977 has, by launching a comprehensive and co-ordinated programme of action, made a significant contribution to the efforts of the international community to seek solutions to the problems associated with desertification,

Convinced further that this action programme will enable Governments and the international community urgently to take concrete measures to stem the spread of deserts,

Expresses its profound appreciation to the President, Government and the people of Kenya for making possible the holding of this Conference and for their generous hospitality and their great contribution to

the successful outcome of its work.

17th plenary meeting

9 September 1977

D. ACTIVITIES ASSOCIATED WITH THE CONFERENCE

A. *Audio-visual presentations*

1. Exhibits of photographs, slides, maps graphics and other materials including a water pump and a table model of a rain-trapping system, were on display in the Kenyatta Conference Centre, the site of the United Nations Conference on Desertification. The countries represented by displays were: Australia, Botswana, Hungary, Israel, Iran, Japan, Kenya, Mexico, Morocco, Peru, Sudan, United Kingdom of Great Britain and Northern Ireland, United States of America, Union of Soviet Socialist Republics and Yugoslavia. UNESCO, FAO and UNEP also set up visual presentations, including a slide-tape demonstration by the International Referral System (IRS) of UNEP.

2. Fifty films on problems of desertification and what is being done to combat them were made available for screening at the Conference. Countries showing their filmed experience included Algeria, Australia, Botswana, Ethiopia, Ghana, India, Indonesia, Iran, Israel, Jordan, Libya, Morocco, Nepal, Niger, Nigeria, Pakistan, Romania, Somalia, Sri Lanka, Sudan, Swaziland, Turkey, United Arab Emirates, United States of America and Union of Soviet Socialist Republics. Continuous showings were held each day of the Conference, and special screenings were arranged on request from delegations.

B. *Nairobi seminar on desertification*

3. From 21 to 25 August 1977, a seminar on desertification was held in the Kenyatta Conference Centre, under the sponsorship of six scientific associations--the American Association for the Advancement of Science, the *Association Française pour l'Avancement des Sciences*, the British Association for the Advancement of Science, the East African Academy, the Indian Science Congress and Interciencia Association.

4. Some 40 scientists from 23 countries attended the seminar. The participants reviewed the draft plan of action to combat desertification, submitting their comments to the Conference Secretariat. They also heard and reviewed a set of scientific papers on subjects relating to desertification. The seminar focused on establishing a set of critical desertification indicators which could be used to assess vulnerability to desertification, predict the onset of the process, monitor its advance, and assess its effects as well as the effects of programmes to combat desertification. An international working group was formed to refine the indicators and test them in the field.

C. *Encounter for journalists*

5. In a new design for such encounters, journalists were encouraged to brief themselves instead of attending a course of lectures. Journalists in developing nations were asked to visit and then write about parts of their own countries undergoing desertification, and the selection of journalists to participate in the Encounter was made on the basis of the articles produced. In Kenya, seven journalists made a visit of inspection to desertified areas in the vicinity of Lake Turkana, where programmes are under way to combat and reverse the process.

6. Twelve journalists from eleven countries were selected to attend the Encounter, which was organized and managed by the Centre for Economic and Social Information, while three others attended the Encounter with assistance from UNDP.

D. *Orientation workshop*

7. A post-Conference orientation workshop was held in Kenyatta Conference Centre from 12 to 15 September 1977. The workshop was attended by 102 persons from 49 countries, plus 18 representatives of nine United Nations bodies, 11 consultants to the Conference on Desertification and staff members of the Conference secretariat. Most of the participants were Government officials or specialists actively involved in their own countries in programmes to combat desertification.

8. The workshop represented an effort to sustain the momentum of the Conference by directing the general prescriptions contained in the Plan of Action to specific action programmes. More precisely, the workshop aimed to: (*a*) consider possible measures which would give effect to the recommendations in the Plan of Action, (*b*) provide specialist advice on practical action to be taken, (*c*) encourage cooperative planning among countries facing similar problems, and (*d*) explore ways in which the United Nations system could continue to provide constructive support to projects undertaken.

9. The workshop discussions, at plenary sessions alternating with working group session, covered a broad range of desertification issues, with special emphasis on aids and obstacles to action. In conformity with the informal nature of the workshop, it was decided that no formal report would be issued. Instead, four papers would be produced and sent to participants: (1) a report on the workshop procedures, including a list of the topics and questions considered; (2) a description of the programmes to combat desertification in which participants expected to be involved upon their return to their home countries; (3) a set of suggestions as to ways in which programmes could receive vigorous support from the international community; (4) a list of participants, giving affiliation and address.

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1 Use of this term, here and throughout the Plan of Action, does not prejudge the position of countries which are in favour of other expressions.

1 General Assembly resolution 2997 (XXVII) of 15 December 1972, establishing the Board, decided that "in order to provide for the most efficient co-ordination of United Nations environmental programmes, an Environment Co-ordination Board, under the chairmanship of the Executive Director of the United Nations Environment Programme, shall be established under the auspices and within the framework of the Administrative Committee on Co-ordination" and that "the Environment Co-ordination Board shall meet periodically for the purpose of ensuring co-operation and coordination among all bodies concerned in the implementation of environmental programmes...".

2 Within the scope of their competence.

1 A/CONF.74/2

2 A/CONF.74/3 and Adds. 1 and 2

1 See chapter I of the report of the Conference.

1 A CONF.74/1, para. 197

2 A/CONF.74/33/Add.1. para. 107.

3 League of Nations, Treaty Series, vol. XCIV, 1929, No. 2138.

4 General Assembly resolution 2826 (XXVI).

5 General Assembly resolution 3411 D (XXX) of 28 November 1975.

6 See chapter V, para. 51, of the report of the Conference.

1 A/CONF.74/20