

COMBATING DESERTIFICATION AND DROUGHT

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Summary

Desertification, which is defined as land degradation in drylands, i.e., arid, semi-arid, and sub-humid areas, is the most serious global environmental issue in the world's drylands, which occupy one-third of the Earth's land surface. Coupled with the adverse effects of human activities and climatic variations, particularly severe and persistent drought, this process has increasingly threatened human survival in many parts of the world's drylands, particularly in developing countries, by destroying the life support systems, i.e. food production, water and energy supply systems, and even socioeconomic systems. Great drought has often aggravated it and has resulted in human tragedies, as evidenced in the Sudano-Sahelian Region of Africa in 1972 and 1984. Currently, it is estimated that drought and desertification seriously threaten the

livelihoods of over 1.2 billion people worldwide in over 110 countries.

Although the processes of desertification appear as an “ecological disease” caused by the loss of vegetative cover, wind and water erosion of soil, soil salinization, etc., it is a “social disease” caused by deep-rooted, various socioeconomic constraints such as poverty, population growth and migration, land tenure problems, marginality in international trade and marketing, civil strife, etc. It has also the close connection with other major global environmental issues, particularly with climate change and biodiversity.

To tackle this “grave disease” of the land, the international community elaborated the United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (CCD), as a follow up to the Agenda 21 statement adopted at Rio de Janeiro in 1992. The CCD, which entered into force in December 1996, is a legally-binding instrument for combating desertification, and mitigates the effects of drought through effective action and an integrated approach, with a view to contributing to the achievement of sustainable development in affected areas, particularly Africa. It stresses the importance of a local, population-involved, community-level, “bottom-up” approach, and socioeconomic dimensions, particularly poverty eradication. The successful implementation of the CCD-based Action Programs are expected to play a key role in solving desertification problems and realizing sustainable development in the world’s drylands.

1. Introduction

Desertification, defined as land degradation in drylands, is as old as the history of civilizations. Although their early impacts were subtle, human-induced modification of natural ecosystems began with the beginning of agriculture and livestock raising, and may date back some thousands of years in many parts of the world’s drylands. It is said that early civilizations based around the Nile, Tigris, Euphrates, Indus, and Yellow Rivers were ruined due mainly to soil degradation—soil erosion and salinization of agricultural lands leading to food insecurity and starvation. More recently, during the early 1930s there was a “Dust Bowl” event which was caused by severe soil erosion by wind and water in the newly-exploited agricultural lands of the Great Plains in the USA—due to the mismanagement of soil. In the world’s drylands, which are characterized by harsh climates with erratic rainfall, low soil fertility, and low biological productivity, as well as extreme poverty, drought-induced environmental degradation and famines are also not new, occurring repeatedly in the long histories of the regions, as evidenced in the drought-prone areas of Africa, Asia, and Latin America. In the Sudano–Sahelian region of sub-Saharan Africa, there was a severe drought period in the early 1900s, culminating in 1913, resulting in widespread famines, massive loss, and southward migrations of affected populations. The severity and the consequences of this drought event are comparable with those of memorable drought event during 1968–1973, and again in 1984, which brought international attention to the tragedy of Sahelian droughts.

In the first Sahelian drought, an estimated 200 000 people and millions of their animals perished, amid a backdrop of devastated croplands and rangelands. The impacts of

massive out-migrations of pastoral and agrarian populations on political, economic, and societal destabilization in surrounding non-affected areas were also a matter of great concern. This led the international community to organize the United Nations Conference on Desertification (UNCOD), held at Nairobi in 1977. UNCOD recognized that the problem of desertification was not only limited to Africa, but also widespread throughout the world's drylands. The background documents of the Conference demonstrated that desertified land is spreading at an annual rate of 600 000 hectares in drylands worldwide.

Although there have been inaccuracies in the available data sets, assessment of the world status of desertification in the early 1990s by UNEP shows that a total of 3.6 billion hectares, i.e. some 70 percent of the 5.2 billion hectares of drylands used for agriculture worldwide, are already degraded (see Table 1). This equals 25 percent of the Earth's land surface. In Africa, South America, and Asia, 73 percent, 72.7 percent and 69.7 percent of dryland agricultural lands are moderately or severely affected, respectively. Degraded agricultural lands also widespread in regions of developed countries, account for 74.1 percent, 64.8 percent and 53.6 percent of agriculturally-used drylands in North America, Europe and Australia, respectively.

In spite of international cooperative efforts since the 1970s, and particularly intensified actions after the adoption of the United Nations Convention to Combat Desertification (CCD) in June 1994, desertification and drought are still a substantial threat to the livelihoods of rural populations and sustainable development in many developing countries. The latest estimates by UNSO and the World Resources Institute indicate that desertification currently affects over 1.2 billion people globally and more than 110 countries, most of them in Africa and Asia. This article outlines the causes and consequences of desertification and the effects of drought, and reviews the ways for combating desertification and mitigating the effects of drought, with special reference to the CCD.

2. What is Desertification and Drought?

2.1 Definition of Desertification

Several connotations of “desertification” are misleading and produce confusion. The term was first used by Aubréville in his 1949 book *Climats, forêts et désertification en Afrique tropicale* (*Climates, Forests, and Desertification in Tropical Africa*). Aubréville used the term to describe the process of environmental degradation taking place in tropical sub-humid to semi-arid zones of the Oubangi–Chari area in present Central African Republic, due mainly to adverse human impacts: “Ce son de vrais déserts qui naissent aujourd’hui, sous nos yeux, dans des pays où il tombe cependant annuellement de 700 à plus de 1500 mm. de pluies.” (p. 332) [“These are true deserts that are being born today, under our very eyes, in regions where the annual rainfall is from 700 to 1500 mm.”] It must be emphasized that the original usage of the term “desertification” does not mean the expansion of desert under arid climatic conditions, but denotes human-induced land degradation in more productive lands under more favorable climatic regime.

The first internationally-agreed official definition of desertification was given at the United Nations Conference on Desertification (UNCOD), held at Nairobi in 1977. Against the backdrop of the human tragedy of the Sahelian Zone—caused by a spell of severe drought during 1968–1973—the Conference defined “desertification” as follows:

- Desertification is the diminution or destruction of the biological potential of 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 purposes at a time when increased productivity is needed to support growing population in quest of development. (UN, 1978)

This ambiguous notion in its definition, coupled with UNEP’s awareness-raising such as “Rolling Back the Desert,” has produced an array of mythical images—such as the progressive, overall desert march to the productive land—and invited endless debate not only among scientists, but also in the international community.

	Irrigated Lands (m.ha)			Rainfed Cropland (m.ha)			Rangeland (m.ha)			Total Agriculturally Used Dryland (m.ha)		
	Total	Degraded	%	Total	Degraded	%	Total	Degraded	%	Total	Degraded	%
Africa	10.42	1.90	18	79.82	48.86	61	1342	996	74	1433	1046	73
Asia	92.02	31.81	35	218	122	56	1571	1188	76	1881	1312	70
Australia	1.87	0.25	13	42.12	14.32	34	657	361	55	701	375	54
Europe	11.90	1.91	16	22.11	11.85	54	112	80.5	57	146	94	65
N. America	20.87	5.86	28	74.17	11.61	16	483	411	85	578	428	74
S. America	8.42	1.42	17	21.35	6.64	31	391	297	76	421	306	73
Total	145.50	43.15	30	458	216	47	4556	3333	73	5160	3562	69

Table1: Global status of desertification/land degradation in agriculturally used drylands (Dregne *et al.* 1991)

In 1990, Global Assessment of Human-Induced Soil Degradation (GLASOD) by UNEP gave the following definition:

- Desertification/land degradation, in the context of assessment, is land degradation in arid, semi-arid and dry sub-humid areas resulting from adverse human impact. Land in this concept includes soil and local water resources, land surface and vegetation or crops. Degradation implies reduction of resource potential by one or a combination of processes acting on land. These processes include water erosion, wind erosion and sedimentation by those agents, long term reduction in the amount or diversity of natural vegetation, where relevant, and salinization and sodication.

This definition, which blames human activities for the major causes of the process, was used by UNEP for the quantitative assessment of the world status of desertification carried out during 1990–1991. However, the possible influence of climate fluctuations, particularly recurrent droughts and soil resilience, on desertification became a matter of discussion during the preparatory processes for the United Nations Conference on Environment and Development (UNCED). Thus, at UNCED held in 1992 at Rio de Janeiro, “desertification” was finally defined in Chapter 12 of *Agenda 21* (“Managing Fragile Ecosystems: Combating Desertification and Drought”) as follows:

- “Desertification” means land degradation in arid, semi-arid, and dry sub-humid areas resulting from various factors, including climatic variations and human activities.

This definition, together with the following definition of “land degradation,” was

completely followed by the United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (CCD).

- “Land degradation” means reduction or loss in arid, semi-arid, and dry sub-humid areas, of biological or economic productivity and complexity of rainfed cropland, or range, pasture, forest, and woodlands resulting from land uses, or from a process or combination of processes, including processes arising from human activities and habitation patterns, such as: (1) soil erosion caused by wind and/or water; (2) deterioration of the physical, chemical, and biological or economic properties of soil; and (3) long-term loss of natural vegetation.

In addition to these official definitions, researchers working in different sectors and areas have proposed various definitions based on their own observations. There are more than 100 definitions which can be grouped into the following categories: 1) extension of desert-like landscape on the desert margin; 2) dryland degradation due to water and wind erosion; 3) decline of biological productivity due to deterioration of vegetation cover and soils; 4) Degradation of socioeconomic systems due to environmental degradation; and 5) ultimate, irreversible degradation of the environment. (Mainguet, 1995)

2.2 Causes of Desertification

Desertification is caused by complex interactions among physical, biological, political, social, cultural, and economic factors. These may be classified into two categories: immediate and root causes. Some important immediate causes of desertification due to human activities in drylands include:

- expansion of cultivation into marginal lands which are unsuited to agriculture;
- reduction of fallow periods in rainfed agricultural lands decreasing crop yields;
- increased fuelwood collection;
- increased timber cutting for building and other domestic uses;
- intensified collection of plants for food and medical uses;
- intensified grazing pressure in rangelands because of rapid growth of livestock numbers;
- sedentarization of livestock around artificial waterpoints, with severe local impacts; and
- improper land and water management of irrigated agricultural lands.

There is general agreement that poverty and population growth are the two major socioeconomic root causes of dryland degradation. Although still not yet well verified, there is a commonly-held view that poor people who are forced to rely heavily on local natural resources, if they are to feed more people, have few alternatives but to open marginal land or to shorten fallow cycles, to graze more animals in impoverishing pasture, and to collect more fuelwood and water for everyday life. Clearly, there is a sense in which these actions undermine existing resources bases and accelerate susceptibility to drought.

Population growth is not always directly related to land degradation. Sometimes, more people means more available labor to till and protect land with increased economic returns, as exemplified by the story “More People, Less Erosion,” from the Machakos Hills in Kenya (see 4.3 below). There are some other important socioeconomic factors, including: lack of appropriate agricultural policies and practices; lack of adequate technologies and know-how for soil and water management; lack of drought preparedness; constraints of land tenure systems; marginality in trade and marketing; lack of political wills and financial resources for natural resources management; and civil strifes, etc. It is the intricate interlinkage of these factors, poverty, and growing populations that drives people in the drylands of developing countries to take actions that inevitably deteriorate the environment and natural resources upon which they depend.

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Bibliography

Aubr eville A. (1949). *Climats, for ts et d sertification en Afrique tropicales*, 351 pp. Paris: Soci t  Editions G ographiques, Maritimes et Coloniales. [This includes the first usage of the word desertification.]

Dregne H., Kassas M., and Razonov B. (1991). A new assessment of the world status of desertification. *Desertification Control Bulletin*, **20**, 6-18. [This presents an estimation of world status of desertification in the early 1990s.]

Lean. G. (1995). *Down to Earth : A Simplified Guide to the Convention to Combat Desertification: Why It is Necessary and What is Important and Difficult about It*, 32 pp. New York: Center for Our Common Future. [This is a concise annotation of the CCD.]

Mainguet M. (1995). *L’Homme et la S cheresse*, 335 pp. Paris: Masson. [This is a comprehensive textbook on drought and/or desertification.]

Middleton N. and Thomas D., eds. (1997). *World Atlas of Desertification*, 182 pp. 2nd edn. London and New York: UNEP/Arnold and John Wiley and Son. [This illustrates various aspects of current status of desertification worldwide.]

S cheresse - Science et changements plan taires (1990–). Montrouge: AUPELF-Uref/Edition John Libber Eurotext. [This is a quarterly journal specialized in drought and desertification issues mainly in Francophone countries.]

Tiffen M., Mortimore M., and Gichuki F. (1994). *More People, Less Erosion: Environmental Recovery in Kenya*, 311 pp. Chichester: John Wiley and Son. [This exemplifies how people turned degraded land into productive land under increased population growth.]

United Nations (1978). *Round-up Plan of Actions and Resolutions. United Nations Conference on Desertification, 29 August– 9 September, 1977*, 43 pp. New York: United Nations. [This is the official report of the UNCOD.]

United Nations (1992). Managing fragile ecosystems: combating desertification and drought. In: *Agenda 21, A/CONF.151/4 (Part II)*. Geneva: United Nations. pp. 46–66. [This includes frameworks on which

CCD is based.]

United Nations (1995). *United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought, particularly in Africa. Text with Annexes*. CCD, 95.1, 71 pp. Geneva: UNEP/CCD. [This is the full text of the Convention to Combat Desertification.]

UNEP (1978–). *Desertification Control Bulletin* [This is a desertification-specified biannual journal published by UNEP.]

UNEP/CCD (1995–). *Down to Earth: The Newsletter of the Convention to Combat Desertification*. Geneva: United Nations. [This provides general information on the progress in implementation of the CCD.]

Biographical Sketch

Professor Hiroshi Kadomura was born in 1931. He gained the degrees of MA and D.Sc. at Tokyo Metropolitan University, before specializing in physical geography, geocology, and land degradation/desertification. He has published around 250 works, and has acted as advisor to various Japanese governmental institutions. He has served as a member of the National Committee for SCOPE (1982-1995), the national Coordinating Committee for UNESCO/MAB (1982-present), the International Panel of Experts on Desertification (IPED/INCD), the UN (1993-1994), and the Expert Group Workshop on Land Degradation of STAP/GEF/UNEP (1996). He has been awarded the Nikkei Prize for Global Environmental Research and currently serves as Emeritus Professor, Tokyo Metropolitan University.