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The International Convention to Combat Desertification: Drawing a Line in the Sand?

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THE INTERNATIONAL CONVENTION TO COMBAT DESERTIFICATION: DRAWING A LINE IN THE SAND?

*William C. Burns**

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Our land, compared with what it was, is like a skeleton of a body wasted by disease.

Plato, 4th Century B.C.

INTRODUCTION

The process known as desertification, which can be broadly characterized as degradation of land, resulting in decreased productivity, is not a new phenomenon. 4200 years ago, the world's first empire, the Akkadian in Mesopotamia, collapsed after only a century of prosperity as a result of severe drought that induced desert-like conditions throughout what is now Iraq, Syria, and parts of Southern Turkey.¹

In the sixth century B.C., the capital of the Kingdom of Kush, Napata, was abandoned because of overgrazing by herds, resulting in erosion and advancement of the desert.² More recently, in the latter part of the 19th Century and early part of the 20th, desertification seriously denuded the productivity of large portions of rangelands in the United States and Australia.³

However, in the past three decades the rate of desertification has increased dramatically in the forty percent of land surface classified as arid or semi-arid,⁴ dealing particularly harsh blows to the besieged inhabitants of developing nations. During the present decade, the amount

1. John N. Wilford, *Collapse of Earliest Known Empire Is Linked To Long, Harsh Drought*, N.Y. Times, Aug. 24, 1993, at C1. The primary cause of desertification in the Mesopotamian region was waterlogging and salinization, a manifestation of poor irrigation practices. H.E. DREGNE, *DESERTIFICATION OF ARID LANDS* 11 (1983). The role of irrigation in desertification will be discussed in greater detail in part II, *infra*.

2. Helen Ware, *Desertification and Population: Sub-Saharan Africa*, in *DESERTIFICATION* 165, 194 (Michael H. Glantz ed., 1977).

3. DREGNE, *supra* note 1, at 101.

4. Abraham Rabinovich, *New Signs of Life In The Hottest, Driest Place on Earth*, JERUSALUM POST, Aug. 12, 1994, at 4B. A number of measures have been utilized to quantify aridity. The Dryness Ratio (R) uses the ratio of total precipitation to potential evapotranspiration, defined as "the maximum amount of moisture which could be evaporated at the surface and transpired by vegetation, if it were available." Louis Kang'ethe, *Desertification — What Is It?*, *RESOURCES*, 1993-II, at 3. Areas marked by a Dryness Ratio of less than 0.05 are classified as hyper-arid, areas with a ratio of 0.05 to 0.19 are classified as arid, and areas with a ratio of 0.20 to 0.49 are deemed semi-arid. *Id.* See also PETER BEAUMONT, *ENVIRONMENTAL MANAGEMENT & DEVELOPMENT IN DRYLANDS* 3-8 (1989). Aridity can also be measured in terms of average annual precipitation. The range in arid lands is from less than 25 millimeters to about 500 millimeters. R.L. HEATHCOTE, *THE ARID LANDS: THEIR USE AND ABUSE* 27 (1983).

of land degraded by desertification will be double that of the past two decades.⁵ This translates into the staggering loss of about 58 thousand square kilometers of once productive land annually, an aggregate area about the size of the state of West Virginia.⁶ By 1993, more than 3.6 billion hectares of the total area of the drylands⁷ was subject to some degree of desertification, representing nearly one quarter of the global land mass.⁸ On the African continent, eighty percent of sub-Saharan dry lands and rangelands, or about 1.5 billion hectares show significant signs of desertification,⁹ as well as seventy-two percent of the drylands in South America and seventy percent in Asia.¹⁰

Several nations in the developing world are suffering disproportionately. In China, desertification is advancing by 2100 square kilometers per year, with over one sixth of the nation's total land mass subject to some degree of degradation.¹¹ In India, forty percent of the land is desertified, encompassing about 120 million hectares.¹² An

5. EARTHACTION, CAN WE PROTECT THE FERTILITY OF THE EARTH? 2 (1994).

6. JAMES WALLS, LAND, MAN, AND SAND 6 (1980).

7. The term "drylands" refers to hyper-arid, arid, and semi-arid zones, as well as tropical sub-humid zones susceptible to the same degradation processes that occur on arid lands. JOHN A. DIXON ET AL., THE ECONOMICS OF DRYLAND MANAGEMENT 1 (1989).

8. 4 AGENDA 21 & THE UNCED PROCEEDINGS 189 (Nicolas A. Robinson, ed., 1994) [hereinafter UNCED PROCEEDINGS]; see also *Japan Urged To Assist In Fight Against Deserts*, JAPAN ECON. NEWswire, Dec. 6, 1994, available in LEXIS, News Library, Jen File.

9. Anaclet Rwegayura, *Environment: Africa Urges New Partnership For Development*, INTER PRESS SERVICE, May 6, 1992, available in LEXIS, News Library, Inpres File. As much as 34% of the remaining land in Africa is now under threat of desertification. *Soil Loss Could Make Vast Lands Infertile, Provoke Famine: Report*, AGENCE FRANCE PRESSE, July 13, 1993, available in LEXIS, News Library, AFP File; see also *Environment: Nations Ready To Sign U.N. Convention On Deserts*, INTER PRESS SERVICE, Oct. 7, 1994, available in LEXIS, News Library, Inpres File ("73% of agricultural drylands are already degraded."); Pratap Chatterjee, *Sands Of Time Running Out As Africa's Deserts Advance*, AFR. NEWS, Apr. 5, 1993, available in LEXIS, News Library, Afrnews File.

10. PANOS, MEDIA BRIEFING NO. 8, NEW DESERTIFICATION CONVENTION MAY HELP 99 COUNTRIES (1994). It should be emphasized that desertification is by no means solely a developing world phenomenon. The United Nations has estimated that 74% of North American agricultural drylands and 65% in Europe have been affected by desertification. *Id.* at 19; see also *Desertification: Dune*, ECONOMIST, Aug. 24, 1991, at 26; Frank Smith, *Desert Gains Ground in Rainless Spain*, THE TIMES (London), Mar. 13, 1992, at 15. However, developing nations are much more vulnerable because they have extremely limited resources to cope with the ramifications of land degradation.

11. Chan Wai-Fong, *Desert Expert Sounds Alarm*, S. CHINA MORNING POST, Aug. 20, 1994, at 7. China's supply of productive land is also being rapidly diminished by industrial and development projects. In the past few decades the total farmland in the country, about 370,000 square miles, has declined by nearly 20%. This could lead to a recrudescence of food shortages in a nation that has 20% of the world's population, but only 7% of the world's arable land. Philip Shenon, *Good Earth is Squandered. Who'll Feed China?*, N.Y. TIMES, Sept. 21, 1994, at A4; see also Chan Wai-Fong, *supra*, at 7.

12. *India Draws Up Afforestation Draft Convention*, XINHUA NEWS AGENCY, Sept. 14, 1994, available in LEXIS, News Library, Xinhua File.

astounding eighty-five percent of the landmass of Kenya is experiencing some degree of desertification, with almost twenty percent currently severely degraded.¹³

The United Nations has estimated that "desertification threatens the future of more than 785 million people, or 17.7 percent of the world's population who live in . . . drylands . . . Of this number between sixty and one hundred million people are affected directly by decreases in productivity associated with the current desertification process."¹⁴ Moreover, the United Nations Environment Program has estimated that if trends continue unabated, about eight billion acres of grazing land, irrigated zones, and croplands will be in jeopardy by the end of the century, threatening the livelihoods of 1.2 billion of the world's 5.5 billion people.¹⁵

Echoing the portrayal by several analysts of desertification as "one of the most serious environmental problems faced by humanity,"¹⁶ the participant nations at the United Nations Conference on Environment and Development (UNCED) in 1992 called on the General Assembly to establish a negotiating committee to draft an international convention to combat desertification.¹⁷ Later that year, the General Assembly established the Intergovernmental Negotiating Committee for the Elaboration of a Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, particularly in Africa (INCD).¹⁸ Over the course of five tumultuous sessions in 1993 and 1994, the representatives of over ninety nations, with the input of a large number of non-governmental organizations, drafted the United Nations Convention To Combat Desertification In Those Countries Experiencing Serious Drought And/Or Desertification, Particularly In

13. M.B.K. Darkoh, *Land Degradation and Resource Management in Kenya*, 19 DESERTIFICATION CONTROL BULL. 61, 61 (1991).

14. Charles L. Amuyunzu, *Desertification in the East and Southern Africa Sub-Regions: Lessons For The Desertification Convention 1* (Aug. 1993) (paper presented at the International NGO Conference on Desertification held in Bamako, Mali 16-20 Aug. 1993; copy on file with author).

15. David E. Pitt, *Nations Mobilize To Limit Deserts*, N.Y. TIMES, Dec. 12, 1993, at 25.

16. ALAN GRAINGER, *THE THREATENING DESERT* 293 (1990); see also H. Dregne et al., *A New Assessment of the World Status of Desertification*, 20 DESERTIFICATION CONTROL BULL. 6, 6 (1991) (citing UNITED NATIONS COMMISSION ON ENVIRONMENT AND DEVELOPMENT, *OUR COMMON FUTURE* (1988)).

17. UNCED PROCEEDINGS, *supra* note 8, at 200.

18. G.A. Res. 188, U.N. GAOR, 47th Sess., Agenda Item 79, U.N. Doc. A/RES/47/188 (1993).

Africa, (hereinafter Convention)¹⁹ and opened the treaty for ratification on October 15, 1994.²⁰

The purpose of this article is to assess the potential efficacy of the Convention in the face of devastation of the world's dryland resources. In this pursuit, I will: 1) Outline the causes and implications of desertification; 2) Present a brief history of past efforts to battle desertification; 3) Discuss the contours and the Convention; and 4) Assess the prospects for the Convention to make a meaningful difference in the struggle to save the world's land.

I. DESERTIFICATION: CAUSES AND CONSEQUENCES

The term "desertification" is defined in the Convention as "land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities."²¹ As this definition implies, desertification is attributable to both human and natural factors. In the following section I will discuss the primary causes of desertification in both contexts.²²

19. U.N. GAOR, 5th Sess., Agenda Item 2, U.N. Doc. A/AC.241/15/Rev. 7 (1994), reprinted in 33 I.L.M. 1328 (1994) [hereinafter Convention].

20. *Id.* Eighty-five nations signed the Convention at the ceremony held in Paris on October 14-15, 1994, and ten nations subsequently have signed. *Signature and Ratification Update*, 4 EARTH NEGOTIATIONS BULL., Jan 18, 1995, at 1, 11 (Internet Version on Econet).

21. The Convention defines "land degradation" as:

[R]eduction or loss, in arid, semi-arid and dry sub-humid areas, of the biological or economic productivity and complexity of rainfed cropland, irrigated 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:

(i) soil erosion caused by wind and/or water,

(ii) deterioration of the physical, chemical and biological or economic properties of soil; and

(iii) long-term loss of natural vegetation[.]

Convention, *supra* note 19, art. 1(f). The INCD defines "arid, semi-arid and dry sub-humid areas" as areas "other than polar and sub-polar regions, in which the ratio of annual precipitation to potential evapotranspiration falls within the range from 0.05 to 0.65." *Id.* art. 1(g).

22. It is important also to emphasize what desertification is *not*. Contrary to the portrayal by some commentators in the popular press, desertification is not the inexorable advancement of the desert frontier, engulfing all usable land in its wake.

The truth is land degradation can and does occur far from any climatic desert; the presence or absence of a nearby desert has no direct relation to desertification. Desertification usually begins as a patch on the landscape where land abuse has become excessive. From that patch, which might be around a watering point or in a cultivated field, land degradation spreads outward if the abuse continues. Ultimately the patches may merge into a homogeneous area, but that is unusual on a large scale.

A. Causes of Desertification

1. Human Factors

Human-induced desertification is caused primarily by four activities: overcultivation, overgrazing, deforestation, and poor irrigation practices.²³

a. Overcultivation

Overcultivation occurs when farmers crop lands more intensively than is sustainable by the land's natural fertility.²⁴ Drylands are particularly susceptible to overcultivation. Soils in arid and semi-arid regions are formed by processes where water is extremely limited. As a consequence, the soils are not leached and the evaporative process produces an accumulation of soluble salts near the land surface. This results in a severe shortage of important nutrients, especially nitrogen and phosphorous.²⁵ The paucity of these nutrients in turn results in low soil organic matter (humus) content, rendering the soil highly susceptible to erosion.²⁶

Soil and wind erosion are primary causes of desertification in the world's drylands.²⁷ Erosion results in exposed topsoil becoming crusted,

DREGNE, *supra* note 1, at 7; see also WALLS, *supra* note 6, at 137. Desertification must also be contrasted with "drought," which is broadly defined as "a prolonged period of below normal rainfall." DAVID S.G. THOMAS & NICHOLAS J. MIDDLETON, DESERTIFICATION: EXPLODING THE MYTH 104 (1994); R. DENNIS CHILD ET AL., ARID AND SEMIARID RANGELANDS 157 (1987). This period lasts usually for one to three years. KWASI NSIAH-GYABAAH, ENVIRONMENTAL DEGRADATION AND DESERTIFICATION IN GHANA 39 (1994); CAMILLA TOULMIN, COMBATTING DESERTIFICATION: SETTING THE AGENDA FOR A GLOBAL CONVENTION 4 (1993). Desertification, by comparison, is a more long-term, insidious process of ecological degradation. M. Kassas et al., *Desertification and Drought: An Ecological and Economic Analysis*, 20 DESERTIFICATION CONTROL BULL. 19, 22 (1991). Drought does enhance the likelihood of land succumbing to desertification, however. "The deadly combination is land abuse during good periods and its continuation during periods of deficient rainfall. Under those circumstances, weakened plants and exposed soils may be unable to withstand the onslaught of drought when combined with overgrazing, cultivation, and wood cutting." DREGNE, *supra* note 1, at 8. The Convention addresses the phenomena of drought also; however, this article shall focus on desertification issues.

23. PANOS, *supra* note 10, at 6.

24. GRAINGER, *supra* note 16, at 65.

25. B. Lundholm, *Adaptations in Arid Ecosystems*, in CAN DESERT ENCROACHMENT BE STOPPED? 19, 22 (A. Rapp et al. eds., 1976).

26. GRAINGER, *supra* note 16, at 67; see also J.A. MABBUTT, DESERT LANDFORMS 11-12 (1979).

27. A recent analysis of soil degradation by the United Nations Environment Program indicates that the primary soil degradation factor in the drylands is wind erosion, affecting over 512 million hectares, followed by water erosion, resulting in the degradation of over 478 million hectares of land. *Status of Desertification and Implementation of the United Nations*

which reduces its ability to absorb water or causes it to be blown away by wind or washed away by water.²⁸ The subsoil that remains after the valuable nutrient layer of topsoil is removed is largely infertile and is characterized by reduced water absorption properties.²⁹

Erosion also wreaks havoc with vegetation; wind carrying soil particles can "sand-blast" plants, shredding leaves through abrasion, killing them outright, or burying them under sand and dust.³⁰ The loss of surface vegetation results in an acceleration of the desertification process, exposing topsoil to further erosion and destabilizing its composition.³¹ Vegetation that does subsequently grow under such conditions will usually respond less well to rain, produce less biomass, and die at increasingly earlier stages of drought.³² The impoverishment of the soil also leads desperate farmers to expand into more marginal rangelands, which quickly become degraded, exacerbating the desertification cycle.³³

Plan of Action to Combat Desertification: Report of the Executive Director, U.N. Environment Programme, 3rd Special Sess., at 20, U.N. Doc. UNEP/GCSS.111/3 (1992) [hereinafter Status Of Desertification]; see also Scott Stevens, Global Resources and Systems at Risk, CHRISTIAN SCI. MONITOR, June 2, 1992, at 10.

28. See WILLIAM G. GRAINGER, *supra* note 16, at 67; see also Robert Goodland, *The Case That the World Has Reached Its Limits: More Precisely That Current Throughput Growth in the Global Economy Cannot Be Sustained*, 13 POPULATION & ENV'T. 167, 176 (1992) (reporting that soil loss rates from erosion exceed soil formation rates by at least ten-fold).

29. Christopher C. Joyner, *Towards Transnational Management of Desertification: The Eco-Politics of Global Concern*, 16 INT'L LAW. 67, 71 (1982).

30. HEATHCOTE, *supra* note 4, at 79; see also Bruce Stutz, *The Landscape of Hunger*, AUDUBON, Mar. 1993, at 55.

31. M.B.K. Darkoh, *The Deterioration of the Environmental in Africa's Drylands and River Basins*, 24 DESERTIFICATION CONTROL BULL. 35, 35 (1994). Exposed soil also reflects a higher proportion of incoming sunlight than soil covered by vegetation. This may, over time, raise atmospheric temperatures, resulting in lower rainfall, which in turn can reduce soil moisture and accelerate the process of desertification. Mike Hulme & Mick Kelly, *Exploring The Links Between Desertification and Climate Change*, ENV'T, July 1993, at 4; William H. Schlesinger et al., *Biological Feedbacks in Global Desertification*, 247 SCIENCE 1043, 1043 (1990). However, the extent that this so-called "albedo effect" affects climatic conditions remains in question. See SECRETARIAT OF THE UNITED NATIONS CONFERENCE ON DESERTIFICATION, DESERTIFICATION: ITS CAUSES AND CONSEQUENCES 19 (1977); Betty Wright, *Does Overgrazing Make The World Warmer?*, NEW SCI., Jan. 11, 1992, at 21. Desertification may also contribute to global warming by denuding plant biomass, reducing the capacity of arid and semi-arid regions to store carbon and nitrogen. *Writer Probes Link Between Climate Change and Desertification*, GLOBAL WARMING NETWORK ONLINE TODAY, June 27, 1994, available in LEXIS, Envirn Library, Curnws File.

32. *Writer Probes Link Between Climate Change and Desertification*, *supra* note 31.

33. GRAINGER, *supra* note 16, at 68. Expansion by farmers into marginal lands also frequently drives pastoralists off their land, concentrating stocks on other land which then results in overgrazing, another cause of desertification. Franklin Cardy, *Desertification: A Global Problem*, RESOURCES, 1993-II, at 42. For a discussion of the impact of overgrazing on drylands, see part II(A)(1)(b), *infra*.

Overcultivation in dryland areas can be primarily attributed to two factors: population pressures necessitating increased crop production and the expansion of cash cropping.

In areas where desertification is of particular concern, such as sub-Saharan Africa and the Middle East, population growth rates of more than three percent are severely taxing food resources.³⁴ Cereal subsistence needs are considered to be 250 kilograms of cereal per person per year. However, in many dryland regions yields are as low as one to two hundred kilograms per person annually.³⁵ This has resulted in desperate efforts to increase food production by moving onto marginal lands, or shortening fallow periods.³⁶

Reduction in fallow periods is particularly harmful to the viability of agricultural lands. Fallow periods permit a land's fertility to regenerate naturally. Additionally, farmers often plant trees on land lying fallow, which provide nitrogen fixing nutrients for the soil and help prevent erosion.³⁷ Fallow lands also often provide grazing resources for livestock, which, in turn, provide fertilizer for the fields.³⁸

At one time, dryland farmers could shift cereal cultivation from field to field, with fallow periods ranging from a few years up to a few decades.³⁹ Increased population densities now preclude this in many dryland regions, and fallow periods have been severely reduced or

34. C.L. Amuyunzu, *From East and Southern Africa*, RESOURCES, 1993-II, at 19; H.N. Le Houérou, *The Nature and Causes of Desertification*, in DESERTIFICATION 17, 25 (Michael H. Glantz ed., 1977).

35. Le Houérou, *supra* note 34, at 26; see also Hakan Toyoda, *Japan Ill-Prepared For Coming Food Crisis*, NIKKEI WKLY., Oct. 24, 1994, at 6. On the African continent, the population has doubled since 1960 and food production has dropped to a level 20% lower than in 1970. Victoria Brittain, *The Continent That Lost Its Way. Who, or What, Can Get It Back on the Right Path?*, WORLD PRESS REV., July 1994, at 23; see also James G. Speth, *Desertification Convention Essential For Food Security*, ENVTL. CONSERVATION, Spring 1994, at 4 (estimating that 13 to 18 million people die from hunger, malnutrition, and poverty-related causes each year).

36. See Michael Ståhl, *Land Degradation in East Africa*, 22 AMBIO 505, 505 (1993); Anacleto Rwegayura, *Environment: Africa Urges New Partnership For Development*, INTER PRESS SERVICE, May 6, 1992, available in LEXIS, News library, Inpres file. The pressure on cultivated lands is likely to increase in the future as global warming trends reduce the productivity of cultivated lands. A recent study indicates that global warming will reduce cereal production in developing nations by nine to 11% by the year 2060, leaving over 1 billion enfamished. Norman Myers, *Environmental Refugees in a Globally Warmed World*, 43 BIOSCI. 752, 757 (1993).

37. GRAINGER, *supra* note 16, at 67.

38. S. P. Malhotra & H.S. Mann, *Desertification and the Organization of Society*, in DESERTIFICATION AND DEVELOPMENT: DRYLAND ECOLOGY IN SOCIAL PERSPECTIVE 305, 309 (Brian Spooner & H.S. Mann eds., 1982).

39. DREGNE, *supra* note 1, at 178; J. Sehgal & L.P. Abrol, *Land Degradation Status: India*, 21 DESERTIFICATION CONTROL BULL. 24, 27 (1992).

eliminated. In some nations, fallowing is actively discouraged by law. For example, in Senegal, a farmer who does not plough her land within a three-year period can be stripped of ownership.⁴⁰

As commodity prices have plummeted in recent years, many developing nations have turned to the cultivation of monocultural cash crops, such as cotton and groundnuts, to obtain revenue for development and to service foreign debt.⁴¹ Many developed nations have actively encouraged this strategy by tying aid to cash crop production. For example, forty percent of rural development funds under the first EEC Lomé Convention went to the development of export crops.⁴²

Cash crops are particularly stressful on drylands. Groundnut cropping in the Sahelian region of Africa;⁴³ for example, has substantially reduced the productivity of dryland soils and has reduced the area used for food crops and fallow time, which further exacerbates soil deterioration.⁴⁴ Similarly, the decision of farmers in Thailand to switch from cultivation of rice to tapioca has resulted in deforestation and over-cultivation of soil, important precursors of desertification.⁴⁵

b. Overgrazing

Overgrazing occurs when livestock density becomes excessive and too many animals are grazed on the same area of rangeland. It is a major cause of desertification in the drylands, the site of one-half of the world's cattle, one-third of its sheep, and two-thirds of its goats.⁴⁶

In recent years, population pressures have substantially increased the size of livestock herds in dryland areas while the area available for

40. INDEPENDENT COMMISSION ON INTERNATIONAL HUMANITARIAN ISSUES, *THE ENCRACING DESERT* 60 (1986) [hereinafter INDEPENDENT COMMISSION].

41. Achoka Awori & Ojijo Odhiambo, *Global Politics and International Trade*, RE-SOURCES, 1993-II, at 11, 12. INDEPENDENT COMMISSION, *supra* note 40, at 24.

42. INDEPENDENT COMMISSION, *supra* note 40, at 82.

43. The Sahel stretches from the Red Sea to West Africa and encompasses an area bigger than the United States. Bruce Finley, *Environmental Refugees Flee Africa's Drought-Stricken Farms*, ST. PETERSBURG TIMES, May 24, 1992, at 18A.

44. Joel Schechter, *New Frontiers in Desert Research*, in *DESERT DEVELOPMENT* 287, 294 (Yehuda Gradus ed., 1985).

45. Susan Litherland, *Environment: Lands Turn Arid While Governments Squabble*, INTER PRESS SERVICE, Jan. 7, 1994, available in LEXIS, News Library, Inpres File.

46. Schechter, *supra* note 44, at 300. In the United States, a recent study indicates that "[o]vergrazing is changing 85 per cent of the West into a desert of scrub and creosote bush," which is "threatening an environmental disaster that could affect everything from food production to scarce water and wildlife." *Spreading Desert in U.S. Blamed on Cattle Grazing*, OTTAWA CITIZEN, Jan. 12, 1992, at D11.

grazing has declined as pastoralists are displaced by farmers.⁴⁷ This has resulted in the concentration of high volumes of livestock on extremely limited areas, contributing to desertification in several ways. First, livestock overgrazing results in the loss of vegetation, which is consumed or trampled, contributing to soil erosion.⁴⁸ One study conducted in South Australia revealed that vegetation may not recover even decades after grazing pressures have abated.⁴⁹ Overgrazing also may result in the displacement of desirable species of plants, such as palatable grass species, which help to hold soil together, by drought-resistant shrubs, which do little to maintain soil viability or prevent erosion.⁵⁰

Second, the trampling of soil, particularly at places where livestock congregate, such as watering holes, results in the pulverization of the soil, contributing to erosion.⁵¹ In addition, pounding by livestock hooves can result in the compaction of soil. This results in surface crusting, which reduces infiltration of water into the soil and accelerates the process of water erosion.⁵²

c. Deforestation

Deforestation is proceeding at a tragic rate in many parts of the developing world, including dryland regions in Africa, Asia, and the Middle East. According to the Food & Agriculture Organization, four million hectares of land are deforested every year in arid lands.⁵³ On the African continent, ten times more wood is harvested annually than is produced in the continent's forests.⁵⁴ Two particularly disheartening examples in Africa are in Ethiopia, where ninety percent of the vegeta-

47. PANOS, *supra* note 10, at 7; GRAINGER, *supra* note 16, at 77.

48. E.E. Okpara & O.A. Salau, *Desertification Dynamics in West and North Africa*, 4 RESOURCES, 1993-II, at 24, 25; SECRETARIAT OF THE UNITED NATIONS CONFERENCE ON DESERTIFICATION, *supra* note 31, at 23.

49. HEATHCOTE, *supra* note 4, at 99.

50. Myra Klockenbrink, *The New Range War Has the Desert as Foe*, N.Y. TIMES, Aug. 20, 1991, at C4.

51. SECRETARIAT OF THE UNITED NATIONS CONFERENCE ON DESERTIFICATION, *supra* note 31, at 23, 205.

52. DREGNE, *supra* note 1, at 41.

53. INDEPENDENT COMMISSION, *supra* note 40, at 25. One analyst recently estimated that Africa alone may be losing more than four million hectares of forest annually. *Africa Loses 4.1 Million Hectares of Forest Annually*, XINHUA NEWS AGENCY, Aug. 26, 1994, available in LEXIS, News Library, Xinhua File.

54. Madeline Weld, *Lethal Environmental Myths: Aiding Population Control in Poor Countries is Matter of Principle, Not Paternalism*, OTTAWA CITIZEN, Jan. 19, 1994, at A9; see also Stutz, *supra* note 30, at 56 ("By the end of this decade . . . 2.4 billion people will be unable to satisfy their minimum energy requirements without consuming wood faster than it is being grown.")

tion has been stripped away since the beginning of the century,⁵⁵ and in Uganda where forest cover has declined from thirty-one thousand square kilometers to less than six thousand square kilometers in the last ninety years.⁵⁶ On the Asian continent, Pakistan's forest cover has been reduced to five percent, well below the twenty-five percent minimum international standard for a sound ecosystem.⁵⁷

The pressure on forests in drylands comes from two directions. First, the desperate need to expand food production has resulted in the clearing of large areas of forestland for crop cultivation. For example, in the Senegalese Mbegue forest, over seven hundred kilometers of forest was cleared for cultivation in less than one month.⁵⁸ In Ghana, forest cover was reduced from an original eighty-two thousand square kilometers to less than twenty-four kilometers by 1983,⁵⁹ primarily because of clearance for cultivation.⁶⁰ Overall, it has been estimated that seventy to eighty percent of ongoing deforestation can be attributed to clearance of land for crop production.⁶¹

A second primary cause of deforestation is demand for fuel wood. About one-third of the world's population, and ninety percent in the developing world, rely exclusively on wood and woody materials as a

55. *Id.* Similarly, the Sudan has seen over 90% of its forest resources disappear in the past three decades, Nhial Bol, *Sudan-Environment: A New Law To Ban Tree-Cutting Flops*, INTER PRESS SERVICE, July 29, 1994, available in LEXIS, News Library, Inpres File, and Madagascar has felled over four-fifths of its forests. George E. Moose, U.S. Environmental Policy and Africa: Challenges And Realities, Address Before the Annual Meeting of the African Studies Association (Dec. 6, 1993), in DEP'T OF STATE DISPATCH, Feb. 7, 1994, at 63.

56. David Musoke, *Environment: Eucalyptus to Fight Deforestation in Uganda*, INTER PRESS SERVICE, Jan. 22, 1991, available in LEXIS, News Library, Inpres File; see also Ma Xiufang, *African in Battle with Deteriorating Environment*, XINHUA NEWS AGENCY, June 28, 1992, available in LEXIS, News Library, Xinhua File (reporting that the Ivory Coast has lost 70% of its forest cover since turn of century, Nigeria 90% and Ghana 80%).

57. Masood Shah, *Pakistan's Forests Shrink As Population Grows*, AGENCE FRANCE PRESSE, June 13, 1991, available in LEXIS, News Library, AFP File; see also *Asia-Food: FAO Pushes Nature-Friendly Farming*, INTER PRESS SERVICE, Oct. 4, 1994, available in LEXIS, News Library, Inpres File [hereinafter *Asia-Food*] (reporting that the rate of deforestation in Asia this decade double that of the 1980s).

58. Okpara & Salau, *supra* note 48, at 25; see also Aly Coulibaly, *Senegal: Battling Desertification*, INTER PRESS SERVICE, Nov. 8, 1991, available in LEXIS, News Library, Inpres File.

59. A. JAMES ANNORBAH-SARPEI ET AL., *THE IMPORTANCE OF PARTICIPATORY APPROACHES FOR DRY LAND MANAGEMENT AND ANTI-DESERTIFICATION PROGRAMS 5* (1993) (published by the Synergos Institute, New York, NY).

60. Jacob E. Oppong, *Desertification in Northern Ghana*, 23 DESERTIFICATION CONTROL BULL. 44, 47 (1993).

61. Henry W. Kendall & David Pimentel, *Constraints on the Expansion of the Global Food Supply*, 23 AMBIO 198, 199 (1994).

source of heat for cooking and warmth.⁶² As supplies of farmland trees and the scrubby woodlands of unfarmed areas have been depleted, poaching has increased in ecologically critical national forests. This has resulted in the diminution or elimination of natural growths of forest and steppes in many dryland regions.⁶³

There is every reason to believe that these pressures will increase in the next decade. As one commentator noted: "The accelerating degradation of woodlands throughout Africa, Asia, and Latin America, caused in part by fuel gathering, lies at the heart of what will likely be the most profound ecological challenge of the late twentieth century."⁶⁴

The loss of tree cover is often the first step in the process of desertification.⁶⁵ "[T]rees play a vital role in protecting and retaining soils."⁶⁶ Tree and plant roots help to anchor soil down, preventing wind and water erosion.⁶⁷ "In Tanzania, for example, one study increased up to a hundred-fold runoff and soil loss after deforestation."⁶⁸ In Ethiopia, where national forest cover has fallen from sixteen percent a few decades ago to just three percent currently, soil is washed away in some areas by rains at the rate of twenty tons per hectare per year.⁶⁹

Diminution of tree cover also diminishes the water retention capacity of soil, contributing to the buildup of silt deposits and impairing the effectiveness of irrigation schemes and water reservoirs.⁷⁰ Finally, trees provide a hospitable microclimate for grasses and supply important nutrients through stem flow to soil.⁷¹

62. Schechter, *supra* note 44, at 305. "In addition, wood is needed in these regions to fire kilns for producing bricks and ceramics, to smoke and cure meat, fish and tobacco, for wattle tanning and for many other basic industrial activities." *Id.*

63. United Nations Conference on Desertification, *Case Study on Desertification, Oglat Mertebe Region, Tunisia*, Tunisian National Institute for Agronomic Research, U.N. Doc. A/CONF.74/12 (1977); Darkoh, *supra* note 13, at 68.

64. Erik P. Eckholm, *The Other Energy Crisis*, in DESERTIFICATION at 39, 43 (Michael H. Glantz ed., 1977); see also Ted Field, *Wood-Starved and Footsore*, AM. FORESTS, Aug. 1993, at 49, 50.

65. ANNORBAH-SARPEI ET AL., *supra* note 59, at 5.

66. Mengiste Deste, *The Ethiopian Situation*, RESOURCES, 1993-II, at 28, 29.

67. Manoah Esipisu, *Spreading Deserts Pose Serious Threat To Poor Nations*, REUTERS LIBR. REP., June 4, 1992, available in LEXIS, News Library, Reuwlw File.

68. GRAINGER, *supra* note 16, at 35.

69. *Id.* at 104.

70. I. Szabolcs, *Salinization of Soil and Water and its Relation to Desertification*, 21 DESERTIFICATION CONTROL BULL. 32, 35 (1992); INDEPENDENT COMMISSION, *supra* note 40, at 25-26.

71. Lundholm, *supra* note 25, at 38.

d. Irrigation/Salinization

One of the primary constraints to increasing food production dryland regions is a shortage of water. Controlled application of water can help expand production in the short-term in the drylands. However, the construction of irrigation schemes that direct the flow of water to root zones in optimum quantities is critical for long-term gains.⁷²

Unfortunately, poor-planned irrigation projects can lead to desertification. When irrigated land is not properly drained, the soluble salts contained in irrigation water accumulate in the system and contiguous soil because the outflow of saline water is prevented or hindered.⁷³ Additionally, expansion of irrigation schemes may cause the ground water table to rise, bringing salts up to the soil profile.⁷⁴ The accumulation of salts in soils creates desert-like conditions because its constituent elements, including sodium chlorides and sodium sulfates, reduce soil fertility, stunt plant growth, and impair the metabolism between the compounds of soil, atmosphere, and hydrosphere that supply the biosphere with nutrients.⁷⁵

Very large areas of the world suffer from salinization, with half of all desertified irrigated croplands being found in South Asia.⁷⁶ In Asia, twenty percent of India's croplands, or over eight million hectares, are affected by salinization and waterlogging. A large portion of desertification in China and Pakistan can also be attributed to this phenomena.⁷⁷ Egypt, which is heavily dependent on irrigation for agriculture, has seen thirty-five percent of its land affected by salinization.⁷⁸ Similarly, Iraq is still attempting to recover from faulty irrigation practices conducted in the region known as Mesopotamia over fifteen hundred years ago.⁷⁹

72. Brian Spooner, *Rethinking Desertification: the Social Dimension*, in DESERTIFICATION AND DEVELOPMENT: DRYLAND ECOLOGY IN SOCIAL PERSPECTIVE 1, 13 (Brian Spooner & H.S. Mann eds., 1982); J. Sehgal & I.P. Abrol, *supra* note 39, at 29.

73. Szabolcs, *supra* note 70, at 35.

74. Sehgal & Abrol, *supra* note 39, at 29.

75. Szabolcs, *supra* note 70, at 32; see also William K. Stevens, *Green Revolution Is Not Enough, Study Finds*, N.Y. TIMES, Sept. 6, 1994, at C11.

76. PANOS, *supra* note 10, at 8.

77. *Id.*; see also Bernard Imhasly, *Fighting Desertification in Pakistan*, SWISS REV. WORLD AFF., Aug. 2, 1994, available in LEXIS, Europe Library, SWSWld File.

78. MICHAEL CARLEY & IAN CHRISTIE, *MANAGING SUSTAINABLE DEVELOPMENT* 26 (1993).

79. DREGNE, *supra* note 1, at 11; see also ENVIRONMENTAL LIAISON CENTRE INTERNATIONAL, SEVENTH CIRCULAR ON DESERTIFICATION 5 (1994) (reporting 50% of irrigated arable land in Sindh Province of India affected by waterlogging and salinity).

Overall, the environmental organization EarthAction reports that 1.25 million acres are desertified each year because of improper irrigation practices.⁸⁰ Recent research pegs the annual loss of farmland from salinization at almost one percent. If current trends continue, nearly thirty percent of the world's presently irrigated acreage will be lost by 2025, rising to nearly fifty percent by 2050.⁸¹

2. Climatic Factors

The role of climatic factors in contributing to the desertification process has been a constant source of controversy.⁸² For example, while Dregne⁸³ and Kharin and Petrov⁸⁴ attributed desertification to both human and natural factors, Grainger⁸⁵ and UNEP in 1991 focused on human activities.⁸⁶ One year later, UNCED adopted a definition which attributed desertification to "various factors, including climatic variations and human activities."⁸⁷ This language was subsequently adopted by the drafters of the Convention.⁸⁸

Climate clearly plays a role in the desertification process, though its precise contribution is hard to calculate.⁸⁹ Rainfall variations are a primary cause of variations in forage production and decisions as to how to utilize rangelands.⁹⁰ Moreover, a substantial amount of the year-to-year variation in vegetation cover in arid and hyper-arid areas can be attributed to changes in rainfall.⁹¹ As indicated earlier, sparse vegetation cover leads to erosion, which accelerates the process of desertification.⁹²

80. *The Spreading Wasteland*, ST. LOUIS POST-DISPATCH, Mar. 29, 1994, at 10B.

81. Kendall & Pimentel, *supra* note 61, at 200; *see also* PANOS, *supra* note 10, at 1 ("Faulty irrigation is turning land to desert as rapidly as new irrigation systems are opened . . .").

82. William K. Stevens, *Drylands More Resilient Than Thought*, HOUS. CHRON., Jan. 24, 1994, at 7B.

83. Harold E. Dregne, *Desertification of Arid Lands*, 53 ECON. GEOGRAPHY 322, 328 (1977).

84. *See* Kang'ethe, *supra* note 4, at 5 (citing Kharin & Petrov's definition of desertification); N.G. Kharin & M.P. Petrov, *Glossary of Terms on Natural Conditions and Desert Development*, Materials for the U.N. Conference on Desertification, Nairobi, Kenya (1977); THOMAS & MIDDLETON, *supra* note 22, at 8-9 (citing Kharin & Petrov's definition of desertification, used at the U.N. Conference on Desertification).

85. GRAINGER, *supra* note 16, at 7.

86. Hulme & Kelly, *supra* note 31, at 6.

87. *Id.*

88. Convention, *supra* note 19, art. 1(a).

89. Hulme & Kelly, *supra* note 31, at 6.

90. Amuyunzu, *supra* note 14, at 23.

91. Hulme & Kelly, *supra* note 31, at 7.

92. *See supra* notes 30-33 and accompanying text.

B. Impact of Desertification

1. Productivity Losses: Agricultural

In contradistinction to the popular image of dryland regions as barren, hostile expanses of land, arid regions are a critical source of food production, accounting for at least one fifth of the world's supply.⁹³ Unfortunately, desertification has substantially denuded food production in the drylands in the past two decades, and this process threatens to accelerate cataclysmically as this decade closes.

Approximately eighty percent of the agricultural land in arid regions suffers from moderate to severe degrees of desertification.⁹⁴ Over sixty million acres of agricultural land are directly affected by decreases in productivity associated with desertification, and an additional fifty to seventy thousand square kilometers of useful land go out of production annually.⁹⁵

The degradation of agricultural lands translates directly into a decline in crop production. For example, in Africa, soil fertility losses linked to desertification has reduced dryland crop yields by twenty-five to fifty percent in severely desertified areas.⁹⁶ Per capita grain production on the continent has plummeted twelve percent since 1981 and twenty-two percent since 1967.⁹⁷

Burgeoning population rates make future declines in food production potentially catastrophic. The world population, currently at 5.8 billion, is increasing by ninety-three to ninety-five million annually, the fastest rate in history.⁹⁸ Under the worst case scenario, "the world could be headed toward an eventual total of [fourteen] billion",⁹⁹ with ninety-five percent of this growth taking place in the world's poorest countries.¹⁰⁰ To meet the nutritional needs of even double the current population, and to

93. HEATHCOTE, *supra* note 4, at 296; *see also* Schechter, *supra* note 44, at 288.

94. DREGNE, *supra* note 1, at 15.

95. Amuyunzu, *supra* note 14, at 19.

96. DREGNE, *supra* note 1, at 182.

97. Kendall & Pimentel, *supra* note 61, at 199; *see also* Asia-Food, *supra* note 57 ("The number of hungry people in Sub-Saharan Africa may reach 300 million by the year 2010.").

98. Dr. A. Sadik, *Population, Resources, Consumption, and Developmental Possibilities*, ENVTL. CONSERVATION, Spring 1994, at 3.

99. Robert S. McNamara, *The Population Explosion*, THE FUTURIST, Nov.-Dec. 1992, at 9. The Sierra Club has recently proffered an even more pessimistic scenario, concluding that world population could rise to as high as twenty-two billion by 2050. *A Future of Their Choosing*, SIERRA, Sept.-Oct. 1994, at 52.

100. Barbara Crossette, *Experts Focus on Stagnating Food Supplies: Meeting to Explore How to Price Yields*, N.Y. TIMES, Feb. 5, 1995, at 9.

ensure an adequate diet for those who are currently undernourished, would require at least a tripling of current food production.¹⁰¹

However, desertification threatens to preclude any future expansion of food production and may even result in a net reduction in cultivable land. The United Nations recently averred: "If the process of desertification is not arrested in the near future, the world shortage of food will increase dramatically within a few decades."¹⁰² Perhaps the most chilling portent of this conclusion is on the African continent where desertification is contributing to stagnating or even declining levels of agricultural production.¹⁰³ In Asia, where population is projected to increase by five billion in the next fifty years, desertification and other causes of land degradation will preclude expansion of the supply of arable lands.¹⁰⁴

2. Productivity Losses: Financial

Desertification results in foregone income of approximately forty-three billion dollars each year, and the vast majority of these losses occurring in developing nations in Asia and Africa.¹⁰⁵ In China, where desertification threatens one third of the nation's total land surface, annual losses are on the order of \$800 million.¹⁰⁶ In the next two decades it is estimated that losses will escalate to \$850 billion for the twenty-year period, up from an earlier estimate of \$520 billion.¹⁰⁷

Moreover, indirect, off-site losses related to desertification, including sedimentation of waterways and reservoirs, flooding of agricultural and urban areas, and wind-transported salt deposits on productive land, may be orders of magnitude higher than direct impacts.¹⁰⁸ For example one study in the State of New Mexico concluded that off-site costs were

101. Kendall & Pimentel, *supra* note 61, at 199; see also DESERTIFICATION: FINANCIAL SUPPORT FOR THE BIOSPHERE 7 (1987).

102. *Status of Desertification*, *supra* note 27, at 3.

103. *Id.* at 25.

104. Klaus Lampe, . . . *Our Daily Bread*, SWISS REV. WLD. AFF., Sept 1, 1994, available in LEXIS, News Library, SWSWLD File.

105. *The Cost of Not Combating Desertification*, ECO, Sept. 1993, at 1; Victor E. Ducrot, *Environment: Agreement on Desertification Depends on Funds*, INTER PRESS SERVICE, Mar. 31, 1994, available in LEXIS, News Library, INPRES File.

106. *Minister Announces Programme to Combat 'Menacing' Desertification*, BBC SUMMARY OF WLD. BROADCASTS, Oct. 6, 1993, available in LEXIS, News Library, BBSCSWB File.

107. Dregne et al., *supra* note 16, at 15.

108. *Let the Figures Speak for Themselves*, ECO, Mar. 23, 1994, at 2.

about *forty-five times greater* than on-site costs,¹⁰⁹ while other studies estimate that off-site losses may be at least two to ten times higher.¹¹⁰

3. Urban Unrest/Environmental Refugees

Fairclough recently observed, "environmental issues now have major political and security implications."¹¹¹ Land degradation powerfully demonstrates the regional and global implications of environmental crises in the last part of this century. Desertification has created millions of dryland "environmental refugees," people who are compelled to abandon the land because it can no longer support them.¹¹² For example, in Burkina Faso, desertification has caused the migration of almost one million men and women, one-sixth of the nation's population.¹¹³ Similarly, one-sixth of the population of Niger has been uprooted as a consequence of desertification.¹¹⁴ The pace of desertification-induced migration has increased substantially in recent years, with two to three thousand individuals joining the ranks every day.¹¹⁵

Beyond the personal tragedy that forced migration inflicts on its victims, it is also a major cause of unrest and political strife in many dryland region nations. Environmental refugees often migrate to urban areas in search of jobs and social services. Urbanization is increasing at the startling rate of eight to ten percent annually in developing countries affected by desertification.¹¹⁶ The urban population of nations in the Sahelian region of Africa quadrupled between 1969 and 1980, largely attributable to migration induced by land degradation.¹¹⁷

Rapid and uncontrolled migration to urban areas often results in social revolt and political unrest. For example, four separate uprisings occurred in Sahelian urban centers in Northern Nigeria between 1980 and 1985, all triggered by migrants who had been displaced by

109. Harold Dregne, *Shifting Sands; Global Desert Advance*, UNESCO COURIER, May 1993, at 32, 36.

110. Dregne et al., *supra* note 16, at 15.

111. A.J. Fairclough, *Global Environmental and Natural Resource Problems — Their Economic, Political, and Security Implications*, WASH. Q., Winter 1991, at 78, 79; see also Myers, *supra* note 36, at 752.

112. John Madeley, *For Millions, Life is a Battle Against the Sand*, GAZETTE (Montreal), June 26, 1993, at 16.

113. INDEPENDENT COMMISSION, *supra* note 40, at 29; Finley, *supra* note 44, at 18A.

114. INDEPENDENT COMMISSION, *supra* note 40, at 31.

115. Madeley, *supra* note 112, at 16.

116. *Status of Desertification*, *supra* note 27, at 12.

117. EARTHACTION, *supra* note 5, at 2. Environmental refugees are also intensifying immigration pressure on Europe and North America. Bruce Finley, *Desertification: Africans Losing Battle Against the Sahara*, S.F. CHRON., Apr. 20, 1992, at A10.

desertification and drought.¹¹⁸ Frustrated by their inability to obtain employment or housing in areas ill-equipped to absorb them, "they gave vent to their feelings of anger, economic powerlessness and frustration which had haunted them for a very long time."¹¹⁹ Similarly, the rapid influx of Hindu settlers fleeing degraded lands into the Sikh-predominated Punjab region exacerbated tensions between the two groups in the 1970s and 1980s.¹²⁰

In a perverse twist of fate, massive migration by refugees fleeing environmental degradation begets yet more environmental damage. Refugees often settle in fragile ecosystems, depleting resources such as woody biomass and beginning the desertification cycle over again.¹²¹ Additionally, mass migration reduces the pool of rural manpower, delaying efforts to rehabilitate dryland areas.¹²²

4. Depletion of Flora And Fauna Resources

Many crops such as wheat, barley, sorghum, and millet, as well as many fodder species, originate in arid and semi-arid territories. Additionally, hundreds of wild plant species indigenous to dryland regions are the source of valuable medicines.¹²³ Desertification's destruction of vegetation may result in the loss of many of these critical flora species, translating into an economic loss "no less severe than the impact of deforestation."¹²⁴

Additionally, desertification threatens fauna species by denuding critical habitat. For example, in Kuwait, desertification is one of the primary threats to several species of animals, including deer, Arab ostriches, baboons, and several predators.¹²⁵ Similarly, desertification threatens the biodiversity of Jordan's species-rich Dana Wildlands.¹²⁶ In the Lake Chad basin, shared by Nigeria, Chad, Niger, and Cameroon,

118. Okpara & Salau, *supra* note 48, at 26.

119. *Id.*; see also Arthur H. Westing, *Population, Desertification, and Migration*, 21 ENVTL. CONSERVATION, Summer 1994, at 110, 112.

120. INDEPENDENT COMMISSION, *supra* note 40, at 31-32.

121. Amuyunzu, *supra* note 34, at 20.

122. *Status of Desertification*, *supra* note 27, at 12.

123. Kassas et al., *supra* note 22, at 22.

124. *Id.* at 23.

125. *Kuwait Wildlife Under Threat*, MONEYCLIPS, July 9, 1994, available in LEXIS, News Library, Moclip File.

126. *There is a Link Between Biodiversity and Desertification*, ECO, Mar. 22, 1994, at 4.

desert encroachment has resulted in the rapid decline in fish from 140 thousand tons in 1960 to seventy thousand tons in 1994.¹²⁷

II. HISTORY OF ANTI-DESERTIFICATION PROGRAMS

A. *United Nations Conference on Desertification*

In 1968, crisis struck in the Sahel region of Africa. Rainfall plummeted from the average annual rate of 284 millimeters to 122 millimeters in 1968 and only fifty-four millimeters in 1972.¹²⁸ During six years of unremitting drought, Lake Chad, at one time the second largest wetland in Africa,¹²⁹ shrunk to only one-third of its normal size, and several primary river systems failed to flood, resulting in the widespread death of sustaining vegetation and shrubs. Shallow wells dried up, severely restricting the range of pastoralists, and patches of new desert developed, ultimately linking up with the great desert to the north.¹³⁰ Before rainfall levels returned to normal in 1974, an estimated 250 thousand people in the region died from famine, drought, and disease. Millions of domestic animals, including cattle, goats, and sheep also perished.¹³¹

The drought in the Sahel focused the international community's attention on the tragic implications of desertification.¹³² In December

127. *Let Us Not Forget the Reason We Are Here*, ECO, June 13, 1994, at 2; see also Suzanne J. Milton et al., *A Conceptual Model Of Arid Rangeland Degradation*, BIOSCI., Feb. 1994, at 70, 72 (stating that loss of termite colonies as consequence of land degradation threatens viability of animal populations who feed on them).

128. *Desertification: An Overview*, U.N. Conference on Desertification, Provisional Agenda Item 4, at 5, U.N. Doc. A/CONF.74/1 (1977).

129. Charles F. Hutchinson et al., *Development In Arid Lands: Lessons From Chad*, ENV'T, July/Aug. 1992, at 16. "[T]he water loss has been so extreme that the lake has split into two pools, south and north — with different elevations." *Id.* at 18.

130. Anthony C. Picardi & William W. Seifert, *A Tragedy of the Commons in the Sahel*, 78 TECH. REV., May 1976, at 42; see also THE POLITICS OF NATURAL DISASTER: THE CASE OF THE SAHEL DROUGHT (Michael H. Clantz ed., 1976).

131. Rick Gore, *The Desert: An Age-Old Challenge Grows*, 156 NAT'L GEOGRAPHIC 584, 597 (1979). Over 25 million people were exposed to starvation, malnutrition, and disease during the six year drought. U.S. DEPT. OF STATE, PUB. NO. 8906, DESERTIFICATION: A GLOBAL CHALLENGE 2 (1977).

132. In the 1971, the All-African seminar in the Human Environment, convened under the auspices of the Economic Commission for Africa (ECA), presented a series of recommendations for combating desertification in Africa. UNITED NATIONS CONFERENCE ON DESERTIFICATION: ROUND-UP, PLAN OF ACTION AND RESOLUTIONS 6 (1978) [hereinafter PLAN OF ACTION]. At the Third Session of the ECA it adopted a resolution seeking international cooperation to implement anti-desertification programs. This resolution was subsequently embraced by the U.N. General Assembly in Resolution 3202 (S-VI) in 1974. G.A. Res. 3202 (S-VI), U.N. GAOR, 6th Special Sess., Supp. No. 1, at 5, 6, U.N. Doc. A/9559 (1974). Also in 1974, the Economic and Social Council of the U.N. adopted resolution 1878 (LVII), which directed all relevant United Nations agencies to pursue "a broad, system-wide attack on

1974, the United Nations General Assembly adopted a resolution calling for "international action to combat desertification" and the convening of a United Nations Conference on Desertification (UNCOD) to effectuate this objective.¹³³

UNCOD convened in Nairobi, Kenya in September of 1977. The conference culminated in the adoption of a "Plan of Action to Combat Desertification" (PACD), reflecting three fundamental objectives; (1) "to prevent and arrest the advance of desertification; (2) to reclaim desertified land for productive use; and (3) 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."¹³⁴ The PACD called for national and regional actions to combat desertification through an integrated program of land management assessment, the implementation of corrective measures to prevent the degradation of dryland ecosystems, and the strengthening of scientific and technological infrastructures in dryland nations.¹³⁵

B. Post-UNCOD Activities

By resolution in 1977, the General Assembly entrusted the implementation of the PACD to the United Nations Environment Program's (UNEP) Governing Council, the Executive Director of UNEP, and the Environment Coordinator Board.¹³⁶ The PACD called for the establishment of a desertification unit within UNEP, an interagency working group on desertification, and a consultative group on desertification control, comprised of relevant bodies of the United Nations, as well as other international organizations, donor countries, multilateral financial agencies, and developing nations.¹³⁷

In 1978, a Desertification Unit was established within the Secretariat of UNEP to handle "all activities related to arid and semi-arid land ecosystems and to combating desertification."¹³⁸ The Unit serves as the Secretariat for the Consultative Group for Desertification Control

this drought problem." E.S.C. Res. 1878, U.N. ESCOR, 57th Sess., Supp. No. 1, at 3, U.N. Doc. E/5570 (1974).

133. G.A. Res. 3337, U.N. GAOR 2nd Comm., 29th Sess., Supp. No. 31, at 64, U.N. Doc. A/9631 (1975).

134. *Report of the United Nations Conference on Desertification*, at 4, U.N. Doc. A/CONF.74/36 (1977) [hereinafter *UNCOD Report*].

135. *Id.* at 6-7.

136. G.A. Res. 32/172, U.N. GAOR 2nd Comm., 32nd Sess., Supp. No. 45, at 106, U.N. Doc. A/32/45 (1978).

137. *Status of Desertification*, *supra* note 27, at 70.

138. See THOMAS & MIDDLETON, *supra* note 22, at 35.

(DESCON) and the Interagency Working Group on Desertification (IAWGD).

DESCON was established by the General Assembly in 1978 to mobilize resources to implement the PACD and to ensure that such resources were invested in the most efficacious manner. Its mandate was subsequently expanded to include information exchanges and policy guidance.¹³⁹ DESCON sought to channel donor funding for anti-desertification programs through its offices; however, most governments expressed their desire to utilize existing bilateral mechanisms or to create new arrangements of this nature.¹⁴⁰

As a consequence, DESCON projects have been severely underfunded. For example, between 1978 and 1985, seventy-four projects were submitted to the DESCON for funding. Of these, only twenty-nine have been implemented in part or in their entirety because donor nations have only provided forty-seven million dollars to the Group for implementation, compared with the projects' actual total cost of \$540 million.¹⁴¹ After eight meetings, DESCON was acknowledged to be a failure and disbanded.¹⁴² DESCON's failure to raise funds was paralleled by the meager results obtained by the U.N. when it established a Special Account for anti-desertification programs. As of 1988 only \$166 thousand had been contributed to the account,¹⁴³ leading the General Assembly to close it the next year.¹⁴⁴

The IAWGD was established by the U.N. upon the recommendation of UNCOD. Its purpose was to coordinate the work of various United Nations agencies involved in anti-desertification efforts, such as the World Bank, the Food & Agriculture Organization, and the World Health Organization, as well as the efforts of regional commissions.¹⁴⁵ However, Dregne's review of the organization on behalf of UNEP in the 1980's concluded that the organization was ineffective and its meetings a waste of time.¹⁴⁶

139. G.A. Res. 165, U.N. GAOR 2nd Comm., 38th Sess., Supp. No. 47, at 133, U.N. Doc. A/30/47 (1984).

140. *Status of Desertification*, *supra* note 27, at 71.

141. *Id.*; see also R.S. Odingo, *Implementation of the Plan of Action to Combat Desertification (PACD) 1978-1991*, 21 DESERTIFICATION CONTROL BULL. 6, 7 (1992).

142. *Summary of Second Session of INC for Elaboration of an International Convention to Combat Desertification 13-24 September 1993*, EARTH NEGOTIATIONS BULL., Sept. 30, 1993 at 1, 6 [hereinafter *Summary of the Second Session*].

143. *Status of Desertification*, *supra* note 27, at 72.

144. G.A. Res. 172, U.N. GAOR 2nd Comm., 44th Sess., Supp. No. 49, at 121, U.N. Doc. A/44/49 (1990).

145. *Status of Desertification*, *supra* note 27, at 31.

146. GRAINGER, *supra* note 16, at 302-03.

At the regional level, a special Sudano-Sahelian Office (UNSO), jointly accountable to the United Nations Development Program and UNEP, was established in 1973 to coordinate drought-recovery programs and to administer a UN Trust Fund for anti-desertification efforts in the region.¹⁴⁷ Additionally, UNSO has promoted environmental information systems to facilitate monitoring of relevant climatic indicia and the gathering of information for natural resource planning. After UNCOD, the U.N. General Assembly expanded the organization's operations to include countries in Eastern Africa;¹⁴⁸ UNSO now works with twenty-two African nations on anti-desertification activities.¹⁴⁹

Unfortunately, UNSO has also not proven to be terribly effective in fulfilling its mission. The organization has feuded with the Permanent Inter-State Committee for Drought Control (CILSS), a regional organization formed by several Sahelian nations, dissipating the efficacy of both organizations.¹⁵⁰ Additionally, UNSO has devoted a disproportionate amount of its resources on construction projects, such as road-building, while de-emphasizing anti-desertification programs.¹⁵¹

The Inter-Governmental Authority on Drought and Desertification (IGADD) was established in 1986 by nations in the Horn of Africa to address desertification issues.¹⁵² The organization's effectiveness has been severely limited by intractable conflicts between member states.¹⁵³ Additionally, weak leadership has resulted in very few initiatives.¹⁵⁴

Overall, UNCOD and the follow-up programs developed to implement its recommendations have proven to be an abject failure. As Dregne observes:

Desertification has been halted in only a few places. Unhappily it continues unabated in most of the land that was suffering at least moderate desertification in 1977 . . . This occurred despite the hundreds of millions of dollars spent on what were called

147. *See id.* at 303.

148. Amuyunzu, *supra* note 34, at 22.

149. *Status of Desertification*, *supra* note 27, at 39.

150. GRAINGER, *supra* note 16, at 303.

151. The organization recently slashed its staff from 106 to 30 in the face of an audit which revealed that it spent a disproportionate share of its funds on its staff. *Sahel Anti-Drought Committee Seeks New Lease On Life*, AGENCE FRANCE PRESSE, Apr. 21, 1994, available in LEXIS, News Library, AFP File.

152. IGADD is comprised of Ethiopia, Sudan, Somalia, Kenya, Djibouti and Uganda. PANOS, *supra* note 10, at 10.

153. Anacleto Rwegayura, *Horn of Africa: Drought Authority's Future Hangs in Balance*, INTER PRESS SERVICE, Sept. 1, 1993, available in LEXIS, News Library, Inpres File.

154. *Id.*

desertification projects . . . In the remainder of Africa and other arid regions of the world, the same grim picture emerges: much money has been spent, much energy expended, but little to show for the effort.¹⁵⁵

This is attributable primarily to three factors. First, anti-desertification programs have been severely underfunded. UNEP recently estimated that total expenditures for desertification are less than one billion dollars, the equivalent of only one dollar per year for each person at risk from desertification.¹⁵⁶ UNEP has estimated that twelve billion dollars annually would be needed to effectively wage the battle.¹⁵⁷

The paucity of funding for anti-desertification efforts under the PACD reflects the bias of donor nations, non-governmental organizations, and recipient nations in favor of agricultural projects, which tend to produce relatively quick results with a high return on investment. By contrast, land rehabilitation projects may not pay off for twenty-five years or more, and the results are often hard to quantify.¹⁵⁸

Second, while the PACD heavily emphasized the establishment of national and sub-regional action plans to implement the plan's recommendations, only twenty out of the ninety-nine countries affected by desertification have drafted national plans.¹⁵⁹ Moreover, very few of the plans that have been formulated have proven to be of any substantive value.

There has been no evaluation of the many and various national planning exercises undertaken, in terms of the opportunity cost in time, resources, and personnel involved in relation to the end-product. Concern expressed by several governments and donors to coordinate the various planning exercises being proposed would suggest that there is currently an over-production of plans. However, in the absence of any assessment of the uses to which plans have been put and of the process itself, it is difficult to judge the marginal utility of each additional plan.¹⁶⁰

155. GRAINGER, *supra* note 16, at 301; see also Fred Pearce, *Mirage of the Shifting Sands*, NEW SCIENTIST, Dec. 12, 1992, at 38 (stating that UNEP's Secretary-General Mostafa Tolba recently characterized the results of the PACD as "pathetic").

156. *Summary of the Second Session*, *supra* note 142, at 6.

157. *Id.*

158. A. Buonajuti, *External Evaluation of the Plan of Action to Combat Desertification*, 20 DESERTIFICATION CONTROL BULL. 30, 31 (1991); Odingo, *supra* note 141, at 12.

159. See TOULMIN, *supra* note 22, at 13-20.

160. *Id.* at 18.

Finally, the PACD has been plagued by in-fighting between organizations addressing desertification issues.¹⁶¹ As indicated previously, turf battles between CILSS and UNCOD have diminished both organization's effectiveness.¹⁶² Similarly, the Sahara-Sahel Observatory (OSS), a mechanism established to improve contact, information sharing and collaboration between the three regions bordering the Sahara desert, has been plagued by a lack of cooperation with CILSS and IGADD "who perceive it as a *potential competitor for funds*."¹⁶³

The fundamental question that thus remains is whether the INCD can meet a more propitious fate than previous initiatives. In the final two sections of this article I will address this issue.

III. THE CONVENTION FRAMEWORK

A. History of the Negotiating Process

In 1992, delegates from 170 nations convened for the United Nations Conference on Environment & Development (UNCED) in Rio de Janeiro, Brazil. The "Earth Summit" was built around the theme of "sustainable development," defined as "development which meets the needs of the present without compromising the ability of future generations to meet their own needs."¹⁶⁴ The Conference focused on a wide array of environmental and development-related issues and culminated in the adoption of the "Rio Declaration" and "Agenda 21" an 800-page blueprint for environmentally sustainable development for the years 1993-2000.¹⁶⁵

Delegates and heads of state from the developing world made desertification a top priority. They called on the conferees to incorporate language into Agenda 21 to request that the U.N. convene a global convention to address the issue.¹⁶⁶ The proposal was initially resisted by

161. *Id.* at 20.

162. *See supra* text accompanying footnote 150.

163. PANOS, *supra* note 10, at 10 (emphasis in original).

164. Colin Isaacs, *Too Much on Old Approaches*, FIN. POST, June 8, 1992, at 10; *see also* William K. Stevens, *Earth Summit Finds the Years of Optimism Are a Fading Memory*, N.Y. TIMES, June 9, 1992, at C4; *African Nations Call for U.N. Talks to Negotiate Treaty on Desertification*, DAILY REP. FOR EXECUTIVES, June 10, 1992, at 112.

165. Sergio Federovisky, *Earth Summit: With Time Running Out, Doubts Remain*, INTER PRESS SERVICE, June 8, 1992, available in LEXIS, News Library, Inpres File; John Vidal, *Good Intentions Doomed by Gulf Between Rich and Poor*, THE GUARDIAN, June 15, 1992, at 6. The delegates also adopted legal binding conventions on biodiversity and climate change. *Id.*

166. *African Nations Call for U.N. Talks to Negotiate Treaty on Desertification*, *supra* note 165, at 112. An African group of nations, spearheaded by Nigeria, had originally

several developed nations for several reasons. The United States contended that it might be more judicious to address the root causes of desertification, such as forestry, climate change, and water resources in separate treaties.¹⁶⁷ Additionally, several industrialized nations, led by Great Britain, resisted the proposal on financial grounds.¹⁶⁸ Ultimately, the impasse was broken and Western governments tepidly backed the proposal.¹⁶⁹ During its forty-seventh session later that year, the U.N. General Assembly adopted a resolution calling for the establishment of the Intergovernmental Negotiating Committee for the Elaboration of an International Convention to Combat Desertification in those countries experiencing serious drought and/or desertification, particularly in Africa, and for the convening of five sessions to finalize the Convention by June, 1994.¹⁷⁰ Preparatory arrangements for the INCD negotiating sessions were made in New York in January, 1993. A Secretariat was established and a Chairman, Bo Kjellén of Sweden, was named to preside over the sessions.¹⁷¹

The first session of the INCD was held in Nairobi, Kenya during May and June of 1993. The Committee focused on the sharing of technical information about desertification and the framework of the Convention. A dispute immediately arose related to the drafting of regional instruments to implement the Convention. The Chairman proposed that

submitted a proposal for "the preparation and the signing of an international convention on combating desertification in Africa" to the UNCED Preparatory Committee in March of 1992. *Earth Summit: Africans Call for Global Treaty on Desertification*, INTER PRESS SERVICE, Mar. 9, 1992, available in LEXIS, News Library, Inpres File. The proposal was subsequently adopted by the preparatory group by a unanimous vote. Jaya Dayal, *Earth Summit: Africa Gets Desertification Treaty But Funds?*, INTER PRESS SERVICE, Mar. 13, 1992, available in LEXIS, News Library, Inpres File.

167. *Id.*; see also Ian McArthur, *Earth Summit Lays Basis for Desertification Convention*, JAPAN ECON. NEWSWIRE, June 11, 1992, available in LEXIS, News library, Jen File.

168. Wang Chunrong, *Desertification Discussion Hits Stumbling Blocks at Rio Conference*, XINHUA NEWS AGENCY, June 10, 1992, available in LEXIS, News Library, Xinhua File. The United States had also initially argued for a regional approach which would focus only on the plight of African nations. *Earth Summit: Africa Scores with Agreement on Desertification*, INTER PRESS SERVICE, June 10, 1992, available in LEXIS, News Library, Inpres File.

169. *Desert Deadlock; UN Convention Versus Desertification*, NEW SCI., June 20, 1992, at 6. Michael Young, spokesperson for the U.S. delegation expressed the continued reservations of the U.S. about a desertification convention, concluding: "Desertification is the result of a disputed set of phenomena. Our experts say the way forward is not a convention, but to address issues such as water, deforestation, land degradation and climate, the solutions to which would solve desertification." *Id.* The British delegation also questioned the efficacy of the approach and further indicated that it believed expenditures on environmental protection in arid regions was already excessive. *Id.*

170. Convention, *supra* note 19.

171. TOULMIN, *supra* note 22, at 20.

an instrument focusing on the problems in Africa be drafted first, with other regional instruments to be negotiated subsequently. This proposal was met with resistance by several representatives of other regions, especially from South America, who felt that their regions' problems were sufficiently serious as to warrant negotiation of all the regional instruments simultaneously. A final decision on this issue was deferred to a subsequent session.¹⁷²

At the second session in Geneva in September of 1993, the Committee considered a draft text for the Convention prepared by the Secretariat and began work on regional instruments for Africa, Asia, and Latin America. Consensus developed on many critical issues, including the Convention's preamble and the need for increased cooperation between developed and developing nations.¹⁷³

The third and fourth sessions of the INCED, held respectively in New York and Geneva, resulted in the production of a draft text of the Convention and draft regional implementation texts for Africa, Asia, and Latin America. However, the critical provisions for financial resources and mechanisms remained unresolved.¹⁷⁴

At the fifth session of the INCED in Paris in June, the Committee formulated the final text of the Convention. Conflicts over financing were resolved by the vague acknowledgment of the "importance of substantial resources" to developing countries combating desertification and the need for new and additional sources of funding.¹⁷⁵ The Committee also completed implementation annexes for Africa, Asia, Latin America, and the Caribbean and the Northern Mediterranean.

The Committee also established interim arrangements for the Convention, requesting the UN Secretary General to make appropriate arrangements for the continuation of the signing period through the next

172. *Just Deserts?*, HARAMATA, June 1993, at 3.

173. *Summary of the Fifth Session of the INC for the Elaboration of an International Convention to Combat Desertification 6-17 June 1994*, EARTH NEGOTIATIONS BULL., June 20, 1994, at 2, 7 [hereinafter *Summary of the Fifth Session*].

174. *Id.* at 2. The developing nations at the INCED sought to insert a provision which would bind developed nations to provide 0.7% of their GNP for Official Development Assistance. This proposal was originally adopted by the UN General Assembly in 1971 in a resolution related to the Second Development Decade, and reiterated by the Group of 77 during the Sixth and Seven special sessions of the General Assembly which focused on proposals by developing nations to create a "New International Economic Order." Johan Kaufmann, *The Evolving United Nations: Principles and Realities*, ACUNS REPS. & PAPERS, 1994-IV, at 16. As Kaufmann observes, the proposal has remained merely an aspiration of the developing world which has been largely ignored by the developed nations. *Id.* Most developed nations, by contrast, preferred the language in Paragraph 33.13 of Agenda 21 which referred to this figure as merely a "target." *Id.* at 3.

175. Convention, *supra* note 19, art. 20.

meeting of the Committee in January of 1995. Finally, the Committee made recommendations to the 49th General Assembly regarding arrangements for further sessions of the INCD. It is contemplated that the Secretariat will continue its work until the convening of the first Conference of Parties after the treaty comes into effect. The Conference of Parties will establish a Permanent Secretariat for the Convention.¹⁷⁶ The Convention will enter into force three months after the deposit of the fiftieth instrument of ratification, acceptance, approval, or accession.¹⁷⁷

B. Convention Provisions

1. Objectives and General Provisions

The Convention's primary enumerated objective is "to combat desertification and mitigate the effects of drought . . . particularly in Africa."¹⁷⁸ The treaty advocates achieving this goal through long-term oriented strategies which utilize a holistic approach to dryland management, focusing simultaneously on improvement of the productivity of land and adoption of conservation and sustainable management programs for land and water resources.¹⁷⁹

The Convention also establishes specific obligations for nations affected by drought and desertification, as well as for developed nations. Affected nations pledge to do the following: 1) accord "due priority" to combating desertification the drought and allocate adequate resources per their capabilities; 2) establish strategies and priorities consistent with principles of sustainable development; 3) address the underlying causes of desertification, with special attention to socio-economic factors that contribute to the phenomena; 4) promote awareness and participation of local populations, especially women and youth in the battles against

176. *Summary of the Fifth Session*, *supra* note 173, at 6.

177. *Convention*, *supra* note 19, art. 36.

178. *Id.* art. 2. In Article 7 the Convention reiterates that the top priority is to attend to the needs of African nations, "while not neglecting affected developing country Parties in other regions." *Id.* art. 7. However, because no quantitative standards are included in the Convention, it is not assured that the Parties will focus on the plight of African countries.

179. Consistent with the Convention's emphasis on integrated planning, the Parties to the Convention also pledge to adopt "an integrated approach addressing the physical, biological and socio-economic aspects of the processes of desertification and drought." *Convention*, *supra* note 19, art. 4. Previous anti-desertification programs, including the PACD have been criticized for failing to take into account critical socio-economic and socio-political factors which play a major role in degradation of land, including international trade patterns, external debt burdens, and poverty. E.B. Rugumayo & J.D. Onyango, *The Impact of International Trade*, RESOURCES, 1993-II, at 16. Chatterjee, *supra* note 9.

drought and desertification; and 5) strengthen laws in this context and establish long-term policies and action programs.¹⁸⁰

Developed country Parties pledge to undertake the following obligations: 1) actively support the efforts of affected developing country Parties in their efforts to combat desertification and drought; 2) provide financial and other resources to assist developing countries, including mobilization of financial resources from the Global Environmental Facility (GEF),¹⁸¹ and encourage private sector funding for desertification and drought program; and 3) provide access to appropriate technologies and expertise, especially to affected developing country Parties.¹⁸²

2. Action Programs

The Convention strongly encourages Parties affected by desertification to establish "national action programmes"¹⁸³ to effectuate the following policies: 1) implementation of long-term oriented strategies, "integrated with national policies for sustainable development;" 2) protection of land that has not been degraded yet or is only slightly degraded; 3) enhancement of climatological, meteorological, and hydrological capabilities and early drought warning systems; and (4) strengthening of cooperative institutional frameworks between donors, governments, local populations, and community groups.¹⁸⁴

180. Convention, *supra* note 19, art. 5.

181. Instrument For The Establishment Of The Restructured Global Environment Facility, adopted June 18, 1994, reprinted in 33 I.L.M. 1278 (1994) [hereinafter Global Environment Facility Instrument]. The GEF was established as a pilot program under the rubric of the United Nations Development Program (UNDP), the World Bank, and the United Nations Environment Program (UNEP). World Bank: Documents Concerning the Establishment of the Global Environmental Facility, 30 I.L.M. 1735, 1740 (1991). Its purpose is to grant concessional funding to developing nations to assist them in implementation of environmental protection programs in four categories: 1) protection of the ozone layer; 2) limitation of greenhouse gas emissions; 3) protection of biodiversity; and 4) protection of international waters. Global Environment Facility Instrument, *supra*, at 1285. The pilot phase of GEF ended in late 1993, after \$1 billion had been committed to 100 projects in developing nations. Pratap Chatterjee, *Environment: New Environment Fund Appoints Chairman*, INTER PRESS SERVICE, July 12, 1994, available in LEXIS, News Library, Inpres File. GEF was established as a permanent organization in 1994, and Mohamed El-Ashry was appointed as its first chief executive officer and chairman. *Id.* The organization is comprised of thirty-two member countries with a budget of \$2 billion for the next three years. *Global Environment Facility to Allow NGOs to Observe Meetings for First Time*, INT'L ENV'T DAILY (BNA) (July 18, 1994).

182. Convention, *supra* note 19, art. 6.

183. *Id.* art. 9(1). The Convention also seeks to focus donor funding in nations where action programs have been established by encouraging developed country Parties to give funding priority to Parties that have implemented a national action program or are participating in a sub-regional or regional program. *Id.* art. 9(2).

184. *Id.* art. 10.

Consistent with the Convention's emphasis on holistic solutions to desertification and drought, the treaty calls on the Parties to promote "alternative livelihoods and improvement of national economic environments" to *inter alia*, eradicate poverty, provide secure food sources, ensure sustainable management of natural resources and agricultural resources, and foster development of efficient energy resources.¹⁸⁵ The Convention also calls on the Parties to provide financial resources to ensure long-term planning of action programs and emphasizes the need to establish cooperative mechanisms that engender support at the local level, including coordination of efforts with non-governmental organizations.¹⁸⁶

3. Scientific And Technical Cooperation

In the realm of information collection and exchange, the Parties to the Convention pledge to develop systematic observation capabilities to assess the processes of drought and desertification. The overarching purpose of such systems is to facilitate early warning and planning that could ameliorate the devastating effects of drought and desertification.¹⁸⁷

The Parties also agree to undertake research and development programs, with a particular emphasis on the specific needs of local populations and acknowledges the value of drawing upon the expertise of such populations.¹⁸⁸ Additionally, to facilitate such programs, the Parties agree to assist in the financing of technology transfer, acquisition, and development through bilateral or multilateral channels.¹⁸⁹

Recognizing the necessity for capacity building, the Parties pledge to strengthen training and research programs at the national level, including support and extension services, early warning systems, innovations in promoting alternative livelihoods and methods to increase food production.¹⁹⁰ The Convention also pledges the Parties to an extensive

185. *Id.* art. 10(4).

186. *Id.* art. 13(1).

187. *Id.* art. 16.

188. *Id.* art. 17. The Convention also calls for the provision of compensation to members of local populations who convey knowledge that is ultimately commercially utilized or incorporated into technology to combat drought or desertification. *Id.* arts. 17(1)(c), 18(1)(e). Of course, the viability of this provision is largely contingent upon the existence of intellectual property right safeguards at the national level. While the Convention calls upon the parties to provide for adequate and effective protection of intellectual property rights this vague admonition may not prove to be sufficient to justify the financial risks attendant to developing products in many developing nations.

189. *Id.* art. 18.

190. *Id.* art. 19.

public education program focused on desertification, as well as broader issues related to sustainable resource use as well as literacy.¹⁹¹

4. Financial Resources

In the critical context of financial support for the Convention, the Parties pledge to "promote the availability of financial mechanisms and . . . encourage such mechanisms to seek to maximize the availability of funding for affected developing country Parties, particularly those in Africa, to implement the Convention."¹⁹² Building on this rather vague exhortation, the Parties agree to establish a "Global Mechanism" to promote mobilization and channeling of "substantial financial resources," including technological transfers on a grant or concessionary basis.¹⁹³ Additionally, the Parties agree to consider policies which facilitate the establishment of financing mechanisms at the national and regional level. Developing nation Parties to the Convention agree to establish or strengthen existing coordinating mechanisms to integrate anti-desertification programs with national development programs, and to ensure that financial resources are used efficiently.¹⁹⁴

5. Institutions And Procedures

The Convention establishes a Conference of the Parties, which will serve as the governing body for the treaty regime. The Conference of the Parties is charged with, *inter alia*, reviewing implementation of the Convention, promoting and facilitating information exchange on measures adopted by the Parties, adopting amendments to the Convention and promoting relationships with other relevant conventions to avoid duplication.¹⁹⁵ The Convention also establishes a Permanent Secretariat to provide administrative support for the Parties and the Convention's programs.¹⁹⁶

191. *Id.*

192. *Id.* art. 21(1).

193. *Id.* art. 21(4). The ultimate decision where to site the Global Mechanism will be made at the first session of the conference of the parties, or by the parties that have ratified the Convention by mid-1997. In addition to coordinating financial transfers, the Mechanism is charged to draw up an inventory of bilateral and multilateral programs that may facilitate implementation of the Convention, to provide advice on innovative methods of financing and to aid Parties, intergovernmental, and non-governmental organizations with information on sources of funding. *Id.* art. 21(5).

194. *Id.* art. 21(3).

195. *Id.* art. 22.

196. *Id.* art. 23.

Finally, the Convention provides for a Committee on Science and Technology (CST) as a subsidiary agency of the Conference of the Parties. The overarching purpose of the CST is to provide the Conference of the Parties information and advice on scientific and technological matters related to combating desertification and mitigating the effects of drought.¹⁹⁷ Additionally, the CST is charged with the task of conducting a survey and evaluation of agencies and organizations willing to become members of a network to support implementation of the Convention.¹⁹⁸

6. Regional Annexes

The Convention contains regional implementation annexes for Africa, Asia, Latin America, and the Caribbean, and the Northern Mediterranean.¹⁹⁹ The impetus for regional annexes emerged during the first meeting of the INCED when the Parties sought to implement the requirements of UN General Resolution 47/188, stipulating that particular attention be devoted to the needs of Africa by drafting a regional instrument for the continent.²⁰⁰ However, Latin American, Caribbean and Asian nations demanded their own annexes, fearing that developed nations would otherwise devote disproportionate resources to the plight of African nations.²⁰¹

The African Annex²⁰² is comprised of nineteen articles that encompasses a broad range of issues related to implementing the Convention in Africa. Provisions include a discussion of the scope and purpose of the annex, commitments on the part of developed nations and nations on the continent, contours of a strategic planning framework and national and regional action programs, and financial mechanisms. The Annex also outlines the particular conditions that the Parties believe contribute to and exacerbate desertification on the continent, including the high proportion of arid, semi-arid and sub-humid areas, the prevalence of poverty in most affected countries, heavy reliance on natural resources

197. *Id.* art. 24(1).

198. *Id.* art. 25(1).

199. *Id.* annex I-IV. The annexes are denominated "an integral part" of the Convention, with references to the Convention constituting references to the annexes, unless expressly provided otherwise. *Id.* art. 29(1).

200. *Summary of the Fifth Session*, *supra* note 173, at 7.

201. *Id.*

202. Convention, *supra* note 19, annex 1.

for subsistence, and the inadequacy of institutional and legal frameworks.²⁰³

The African Annex is unique in several aspects from the other annexes attached to the Convention. First, it is the only regional annex that articulates specific financial commitments on the part of donor and affected nations.²⁰⁴ Second, in keeping with the Parties' particular concern for the plight of African nations, the Annex calls for the preparation of national, subregional, and regional action programs pending entrance of the Convention into force.²⁰⁵ Finally, it provides a far more detailed discussion of the contours for national action programs than the Convention or any of the other regional annexes.²⁰⁶

The Asian Annex,²⁰⁷ by contrast to the African Annex, is comprised of only eight articles, which outlines the purpose of the annex, particular conditions in the region, contours for national and subregional action programs, proposals for regional cooperation, and a discussion of how to mobilize financial resources to implement the Convention. Additionally, its provisions are general in scope, reflecting the belief of Asian nations that detailed provisions were not appropriate on a continent marked by great geographical diversity.²⁰⁸

The Annex For Latin America And The Caribbean²⁰⁹ is also brief, encompassing only seven articles that closely tracks the provisions of the Asian annex. However, one important difference is that the annex strongly emphasizes the link between desertification and biodiversity loss,²¹⁰ as well the importance of promoting the use of traditional technologies and know-how.²¹¹

The final convention annex, for the Northern Mediterranean,²¹² addresses the needs of Greece, Portugal, and Spain. Its ten articles differ from the other annexes in several ways. First, whereas most of the other annexes emphasize the link between desertification and drought-related problems to socio-economic factors, the Northern Mediterranean annex

203. *Id.* art. 3.

204. *Id.* arts. 14, 15.

205. *Id.* art. 7. The African Annex also provides for according African nations priority in the transfer, acquisition, adaptation and development of technology. *Id.* art. 17.

206. *Id.* art. 8.

207. *Id.* annex 2.

208. *Summary Of The Fifth Session*, *supra* note 173, at 8. Asian nations were also chary to enter into detailed commitments because of their aversion to becoming "legally-bound to financial obligations." *Id.*

209. Convention, *supra* note 19, annex 3.

210. *Id.* art. 4(j).

211. *Id.* art. 5(c).

212. *Id.* annex 4.

focuses on scientific indicia and only alludes to one economic cause: concentration of economic activity in coastal areas.²¹³ Additionally, the Annex expressly disqualifies member nations from financial assistance under the Convention.²¹⁴ Finally, the Annex is the only one that specifically provides for coordination of its activities with other subregions and regions, emphasizing collaboration with northern Africa.²¹⁵

The Convention to Combat Desertification and its accompanying regional annexes provides a comprehensive framework to address one of the most world's most pressing environmental problems. However, if one were to lay the new treaty side-by-side with the 1977 Plan of Action To Combat Desertification one would find a striking number of similarities in their substantive provisions. Thus, the question that must be asked is whether there is any reason to believe that the Convention will succeed in the face of the abject failure of the PACD.

IV. THE CONVENTION TO COMBAT DESERTIFICATION: OASIS OR MIRAGE?

A. Overview

The ultimate success or failure of the Convention to Combat Desertification will probably ultimately turn on the following issues: sufficiency of financial resources, effectiveness of research programs, responsiveness to socio-economic factors; attention to the role of women in land use and stewardship; and commitments to local decision making. I will address each of these issues in the remainder of this section.

B. Financial Mechanisms

Paucity of funding was one of the primary reasons that the PACD failed to ameliorate desertification.²¹⁶ Unfortunately, the current political and economic climate is probably one of the least propitious in history to launch a major new initiative such as the Convention to Combat Desertification. As indicated earlier in this article, the world is currently spending only about one billion dollars annually on anti-desertification programs.²¹⁷ By contrast, the United Nations has estimated that expenditures of approximately twelve billion dollars per year are necessary,²¹⁸

213. *Id.* art. 2(g).

214. *Id.* art. 9.

215. *Id.* art. 10.

216. *See supra* notes 156-57 and accompanying text.

217. *See supra* note 157 and accompanying text.

218. *See supra* note 157 and accompanying text.

and some analysts peg the figure as high as twenty-two billion dollars.²¹⁹ Further, UNEP estimates that an effective anti-desertification program must operate for at least twenty years.²²⁰

Given the impoverished state of many nations beset by desertification²²¹ the lion's share of funding for the Convention must flow from the developed world if it is to succeed. However, most prospective donors are in a state of retrenchment. United States foreign assistance has slipped to its lowest level since World War II, dropping more than twenty percent since 1991.²²² Moreover, the United States plans to slash its contributions to UNEP by up to thirty percent in the next few years,²²³ and phase out twenty-one United States Agency For International Development (USAID) field mission offices over the next three years, nine of them in Africa.²²⁴ The new Republican leadership in the House and Senate has also indicated that they will target foreign assistance for further cuts in the next few years as part of its plan to reduce the nation's budget deficit.²²⁵

Industrialized nations have firmly rebuffed the entreaties of developing nations to pledge substantial additional funding for the initiatives negotiated at the UNCED and the INCED. During the UNCED, industri-

219. *The Spreading Wasteland*, *supra* note 81, at 10B; *The Cost of Not Combating Desertification*, 7 ECO, Sept. 1993, at 1.

220. Pratap Chatterjee, *Environment: High Populations Can Prevent Deserts*, *Say Activists*, INTER PRESS SERVICE, Mar. 26, 1994, available in LEXIS, News Library, Inpres File.

221. Sixty-two percent of the population in Sub-Saharan Africa and 60% of the inhabitants in drylands live in absolute poverty. Robert W. Kates & Viola Haarmann, *Where the Poor Live*, ENV'T, May 1992, at 6-7. In the Sudano-Sahelian region of Africa, encompassing the dry zones of West and East Africa, per capita income in many nations, including Mali, Burkina Faso, Niger, Chad, Sudan, Ethiopia and Somalia, is less than \$400, making them "some of the poorest countries in the world." PANOS, *supra* note 10, at 2; *see also* Weld, *supra* note 55, at A9 ("[O]ne fifth of the over five billion people alive today live in abject poverty."); Suvendrini Kakuchi, *Experts Call for Urgent Global Green Action*, INTER PRESS SERVICE, Oct. 26, 1994, available in LEXIS, News Library, Inpres File ("More than a billion people live on less than one dollar per day . . .").

222. Steven Greenhouse, *Foreign Aid and G.O.P.: Deep Cuts*, N.Y. TIMES, Dec. 21, 1994, at A6.

223. Kakuchi, *supra* note 222.

224. *See* George E. Moose, *U.S. Environmental Policy and Africa: Challenges and Realities*, in DEP'T OF STATE DISPATCH, Feb. 7, 1994. USAID has reduced its budget by 20% since President George Bush left office. Tom Masland & Jane Whitmore, *Going Down the Aid 'Rathole'?*, NEWSWEEK, Dec. 5, 1994, at 39.

225. Senator Mitch McConnell, the new chairman of the Subcommittee on Foreign Operations, has proposed reducing foreign assistance by 20% except to the Middle East and Europe. Moreover, McConnell has proposed linking foreign assistance to United States security and economic interests, a chilling portent for African nations in the post Cold-War era. Steven Greenhouse, *G.O.P. Senate Bill Would Slash Aid for Africa*, N.Y. TIMES, Dec. 13, 1994, at A9.

alized states were able to expunge a proposed provision in Agenda 21 by the G-77, a group of 128 developing nations, for a "substantial" initial commitment of money by developing nations to fund environmental projects. A pledge to convene a subsequent "pledging" conference to commit additional funds was also purged from the final text of Agenda 21.²²⁶

At the INCD negotiating sessions, developing nations sought to bind industrialized states to a commitment of new and additional sources of financial assistance to support implementation of the Convention.²²⁷ In rejecting this request, many industrialized nations, including members of the European Community, argued that past anti-desertification programs had failed because of ineffective use of resources, rather than as a consequence of inadequate funding.²²⁸ As a result, developing nations were forced to accept the amorphous pledge by developed states that they would "mobilize substantial financial resources" on behalf of the Convention's objectives. At the signing ceremony in October, several industrialized nations, including the United States, France, Britain, Italy, and Japan announced that they were doing little to alter their anti-desertification programs apart from launching a few exploratory studies.²²⁹

While the Convention suggests that additional funding may be drawn from the Global Environment Facility,²³⁰ this is a distressfully inadequate financial mechanism. First, GEF has only two billion dollars in funds to utilize over the next three years, compared to an annual need of ten to twenty-two billion dollars for an effective anti-desertification program. Second, GEF funds can only be utilized for programs in the areas of reducing greenhouse gases, protecting the ozone layer, preserving biodiversity and protecting international waters. Thus, only anti-desertification programs related to one of these pursuits can be funded

226. Michael Stott, *Negotiators Trim Earth Summit Calls for Cash*, REUTERS, June 10, 1992, available in LEXIS, News Library, Reuna File. The African bloc at UNCED also called for debt forgiveness and pledges of higher market prices for African exports; these requests also fell on deaf ears. Jaya Dayal, *Earth Summit: Africa Gets Desertification Treaty but Funds?*, INTER PRESS SERVICE, Mar. 13, 1992, available in LEXIS, News Library, Inpres File.

227. *Implementation of Decisions and Recommendations of the United Nations Conference on Environment and Development: Elaboration of an International Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa*, U.N. GAOR, 48th Sess., Agenda Item 99, at 17, U.N. Doc. A/48/226/Add.1 (1993).

228. *Id.*; see Irwin Arief, *Poor Nations Say Rich Ignore Fight Against Deserts*, REUTER EUR. BUS. REP., Oct. 14, 1994, available in LEXIS, News Library, Reueub File.

229. Arief, *supra* note 228.

230. Convention, *supra* note 19, art. 20(2)(b). For a description of the Global Environmental Facility, see *supra* note 181 and accompanying text.

under the facility.²³¹ Finally, desertification programs must compete for this severely limited pool of funds with a vast array of other initiatives that could be financed under the GEF. UNCED has estimated that activities related to implementation of Agenda 21 would require approximately \$625 billion annually, rendering the GEF fund "a drop in the ocean in comparison to the requirements estimated at Rio."²³²

Moreover, even if developed nations were willing to substantially increase foreign aid disbursements, institutional biases against desertification projects would probably ensure that very little additional funding would flow to such programs. This is true for several reasons. First, very large percentages of foreign bilateral and multilateral aid, often up to eighty percent, are tied to the purchase of goods and services in the donor nation.²³³ As one commentator succinctly notes, "[a]id is a business investment."²³⁴ Because it is easier to tie aid to large capital items, the lion's share of foreign assistance goes to major projects such as dams, roads, or hospitals, rather than the smaller, rural-based projects which may be critical for combating desertification.²³⁵

Bilateral donors now require more feedback from their aid in terms of contracts for home-based industries or employment of their nationals on projects in developing countries. Italy, for example, is currently entering the bilateral field in a big way, with specific contributions for food production and rural development in the Sahel. It is also insisting, however, on substantial sales of its own equipment as part of its packages, even though heavy mechanization may be inappropriate in desertified countries. In general, this means that donors shy away from desertification-related projects, which rarely contain any significant kick-back for the donors; rather they concentrate on projects that may pro-

231. *Environment: Nations Ready to Sign U.N. Convention on Deserts*, INTER PRESS SERVICE, Oct. 7, 1994, available in LEXIS, News Library, Inpres File.

232. Kartini Abd. Kadir, *Malaysia: Don't Backtrack on ODA Pledges*, BUS. TIMES, Nov. 9, 1994, available in LEXIS, News Library, Busdtl File.

233. *Tied Aid: The Facts*, ECO, June 8, 1994, at 2.

234. *Tied Aid Incompatible with Rationalization of Resources*, ECO, June 7, 1994, at 2; see also Lucy Johnson, *Development: Pact Needed to Halt Poverty, Says UNDP*, INTER PRESS SERVICE, June 1, 1994, available in LEXIS, News Library, Inpres File.

235. *The Kindness of Strangers*, ECONOMIST, May 7, 1994, at 19, 20. According to some estimates, recipients of tied assistance pay, on average, 15% more than prevailing prices for tied services and products, further diminishing the value of foreign assistance. *Id.*; see also *Empty Promises*, ECONOMIST, May 7, 1994, at 11. GEF, cited in the Convention as a prospective source of funding for anti-desertification projects, has also demonstrated a proclivity for funding large projects. See Chatterjee, *supra* note 181.

vide valuable returns — for example, building and road construction and the setting up of industrial plants.²³⁶

Such skewed priorities are reflected in current “anti-desertification” projects supported by foreign assistance. According to a recent analysis conducted by UNEP on spending by the World Bank, FAO, UNESCO, UNEP, and USAID on desertification projects, only about ten percent of designated funds were spent on actual field control of desertification. The vast proportion of such funds was spent on projects only indirectly linked to anti-desertification efforts, such as construction of infrastructure or agricultural support.²³⁷

Moreover, donors have a strong preference for projects “[that] yield quick visible results that would easily translate into cost-benefit figures.”²³⁸ While the cost-benefit ratio of desertification programs can be very high,²³⁹ the payoff from such programs usually does not manifest itself for twenty years or more,²⁴⁰ far too long for donor agencies who feel compelled to demonstrate quick results. Developing nations evince similar biases toward investment projects that yield quick and tangible results, also gravitating against anti-desertification initiatives.²⁴¹

Developed nations oppose additional funding for desertification programs primarily on two grounds. First, they argue that burgeoning economic problems at home preclude them from making a major new financial commitment to the Convention.²⁴² Second, they contend that the focus should be on diverting money from current development programs that have proven ineffective.²⁴³

In terms of the question of financial capacity, proponents of the Convention must emphasize to prospective donors that the costs of allowing desertification to continue unabated are egregiously high for

236. INDEPENDENT COMMISSION, *supra* note 40, at 82.

237. See THOMAS & MIDDLETON, *supra* note 22, at 7; A.R. Gigengack et al., *Global Modelling of Dryland Degradation*, in DRYLAND MANAGEMENT: ECONOMIC CASE STUDIES 330, 334 (John A. Dixon et al. eds. 1990).

238. Buonajuti, *supra* note 158, at 31.

239. See Dregne et al., *supra* note 16, at 16 (explaining the cost-benefit ratio for dryland anti-desertification campaign 2.5:1); Gigengack et al., *supra* note 237, at 333 (explaining the ratio of annual agricultural production foregone to actual costs required to stop desertification is approximately ten to one).

240. STRYK THOMAS & JOHN GAUDET, DRYLAND MANAGEMENT AND THE USAID RESPONSE IN AFRICA 23 (1993).

241. Odingo, *supra* note 141, at 12; see generally Michel Batisse, *A Long Look at the World's Arid Lands: UNESCO in Action*, UNESCO COURIER, Jan., 1994, at 34.

242. See Letter from Ambassador Robert M. Pringle, Director, Office of Ecology and Terrestrial Conservation, U.S. Dept. of State (Feb. 16, 1994) (on file with author).

243. Arieff, *supra* note 228.

developed nations as well as developing ones. These costs include the financial impact of immigration by refugees,²⁴⁴ as well as the massive expenditures of food aid and other logistical support that must be continually provided to areas beset by drought and desertification.²⁴⁵ Thus, funding of effective drought and desertification programs may, over the long term, prove to be highly cost-beneficial. Unfortunately, the short-term orientation, which politics often dictates in many nations, may deny the Convention the funding that is critical to its effective implementation.²⁴⁶

In terms of the contention of donor nations that money simply needs to be diverted from ineffective programs, it should be noted that donors often contribute to these failures by channeling the lion's share of assistance to inappropriately large-scale projects, or programs that benefit their own commercial interests. Moreover, the diversion of anti-desertification funds by developing nations to other projects helped to ensure that past initiatives has failed.²⁴⁷ Unless a new approach can preclude donor and donee nations from such counterproductive practices, the Convention will surely be rendered nugatory.

Perhaps the best means to ensure that anti-desertification funds are utilized effectively is through the creation of National Desertification Trust Funds (NDTFs) to implement the national action plans prescribed by the Convention. Trust Funds are "either publicly or privately constituted organizations which solicit and manage funds from various sources and from these funds make grants to support environmental and sustain-

244. Finley, *supra* note 43, at 18A.

245. As Cardy states: "Between 90% and 95% of the several billions of dollars spent annually on food relief by the world donor community goes to drylands. Food relief costs are increasing annually while desertification continues unabated." Cardy, *supra* note 33, at 40.

246. It could also be argued that industrialized nations bear a substantial amount of responsibility for the spread of desertification in developing nations, engendering a moral obligation to render additional assistance to reverse these trends. For example, European nations have annually dumped as much as 54 thousand tons of heavily-subsidized beef in West African nations in an effort to protect the income of European Community farmers. HEINZ GREIJN, *TRADE AND DESERTIFICATION* 4 (1993). The amount of frozen and chilled beef dumped by Europe in West Africa increased seven-fold between 1986 and 1993. *Fat of the Land: Made In Europe*, RESOURCES, 1993-II, at 12. In addition to imperiling the livelihood of over four million in nations such as Senegal and the Ivory Coast, "[u]nfair market competition leads to bigger herds of unsold cattle causing land degradation around the waterholes because of overgrazing." *Id.*; see also Fintan O'Toole, *Subsidizing Our Farmers Helps to Destroy African Economies*, IRISH TIMES, Dec. 15, 1993, at 12. Additionally, colonialists in many African nations fostered a dependency on crops that are particularly stressful on the land, such as groundnuts and cotton. See GREIJN, *supra*, at 3; Ware, *supra* note 2, at 180. An emphasis on cash crops has also substantially reduced the acreage under food crops in many developing nations, forcing farmers to move to cultivate marginal lands which quickly succumb to desertification. Awori & Odhiambo, *supra* note 41, at 12.

247. See *supra* note 158 and accompanying text.

able development projects.”²⁴⁸ Funds are usually administered by a board of directors composed of representatives of the donee nation’s government, representatives of the donor community, representatives of civil society, such as local community groups and national non-governmental organizations, and research institutions.

NDTFs could provide several advantages over current methods of administering anti-desertification programs. First, by providing input from a wide array of interests the biases of donor and donee governments toward inappropriate projects could be tempered, albeit not eliminated.²⁴⁹ Second, NDTFs could receive money both from traditional donors and from private institutions, which are chary to directly provide funds to government entities.²⁵⁰ Third, because NDTFs could receive funding from multiple sources, it would help nations avoid the interne-cine warfare between different institutions and programs that often characterizes anti-desertification efforts.²⁵¹

There are currently at least twenty-one Trust Funds operating worldwide, administering funds in excess of \$296.4 million.²⁵² As one recent report on such mechanisms concludes, Trust Funds provide “a working example of coordination and cooperation between government, NGOs and the private sector [and] provide a level of flexibility and transparency which is seldom achieved in conventional funding mechanisms.”²⁵³

Scarce funds should also be utilized in the most efficient manner possible. This could be effectuated by implementing a system of “tri-age,” whereby funding would be focused in dryland areas where there is a good chance of rehabilitating the land and where the cost-benefit ratios are in favor of doing so.²⁵⁴ For example, funding should not be channeled into the estimated seventy-five percent of rangelands and thirty percent of rainfed croplands where the benefit/cost ratio is less than one for reversing the effects of desertification.²⁵⁵ Additionally,

248. *Coordinating Desertification Funds Effectively*, Eco, June 13, 1994, at 1.

249. *Id.*

250. *Id.*

251. *Id.* at 2.

252. *Yes . . . Trust Funds Really Work*, Eco, June 9, 1994, at 3.

253. *Id.*

254. DIXON, *supra* note 7, at 54–55. The Convention endorses the judiciousness of this approach, calling for affected nations to “give particular attention to the implementation of preventive measures for lands that are not yet degraded or which are only slightly degraded.” Convention, *supra* note 19, art. 10(2)(c).

255. DREGNE, *supra* note 1, at 23. UNEP has classified nearly half of African rangelands south of the Sudan-Sahelian region and approximately one-third of the Sudan-Sahelian region as “severely desertified,” meaning that desertification is virtually irreversible. See Jerrold L. Dodd, *Desertification and Degradation in Sub-Saharan Africa: The Role of Livestock*, BIOSCI., Jan. 1994, at 28.

because "preventing desertification is easier and cheaper than restoring desertified land to its most productive level,"²⁵⁶ priority should be accorded to the implementation of preventive strategies for land that is not yet degraded or only slightly degraded.

C. Research Programs

As Thomas & Middleton observe, our poor understanding of dryland environments, and a paucity of long-term data on relevant indicia, such as climatic trends and geomorphology, has contributed substantially to the current plight of many dryland countries.²⁵⁷ Critical research priorities include soil and vegetation research, climatic research, and livestock research.

Knowledge of soil characteristics in dryland areas, including fertility, structure, and texture is "a pre-requisite for developing a range resource management plan."²⁵⁸ This requires, *inter alia*, conducting soil surveys, developing soil erosion hazard maps, and assessing the water infiltration and water holding capacity of soil resources.²⁵⁹ Additionally, because vegetation resources are "the main grazing resource of pastoralists . . . [and] an important indicator of desertification or environmental deterioration . . . a major emphasis should be placed on vegetation studies."²⁶⁰ This should include an assessment of the status and trends of woodland resources and their potential for regeneration in degraded areas, formulation of management strategies in areas where forest resources are being overexploited, and an inventory of range vegetation resources.²⁶¹ Given the paucity of data on the physical aspects of land in most developed countries,²⁶² the Convention's call for national, regional, and international research programs is critical. However, given the biases in favor of big projects and quick results,²⁶³ it is possible that this commitment will be honored only in the breach.

Research on climatic trends can be critical to ascertaining the interaction of climatic fluctuations, drought and desertification. Unfortunately, our current knowledge base is woefully inadequate in most

256. DREGNE, *supra* note 1, at 166; see also UNCED PROCEEDINGS, *supra* note 8, at 184.

257. THOMAS & MIDDLETON, *supra* note 22, at 110.

258. Amuyunzu, *supra* note 14, at 24.

259. *Id.*

260. *Id.* at 25.

261. *Id.*

262. INDEPENDENT COMMISSION, *supra* note 40, at 94.

263. See *supra* note 158 and accompanying text.

dryland regions. In many African nations, for example, recording stations have interrupted time series and the understanding of weather systems is inadequate to predict the occurrence, timing, and duration of drier and wetter periods.²⁶⁴ Convention signatories should emphasize the use of remote sensing systems utilizing low-cost ground stations and geostationary environmental satellites. Advanced training in desertification assessment and monitoring techniques should also be a top priority in this context.

As indicated earlier in this article, livestock production is a major cause of desertification in the drylands. However, given the fact that the subsistence economy of most dryland communities is based on livestock,²⁶⁵ we must find a way to reconcile this economic activity with the interests of sound land management practices. Research foci should include surveys of livestock numbers and distribution during both wet and dry seasons, identification and monitoring of major livestock diseases, investigation of dietary preferences of livestock species and foraging behaviors, and marketing surveys to ascertain how markets are affected by herd movements.²⁶⁶

D. Socio-Economic Factors

As Amuyunzu has noted, an effective anti-desertification program must not only focus on ecological causes of the phenomena, but also must address the social and economic factors which lead humans to degrade land:

Humans determine how land is utilized, therefore a knowledge of human behavior is crucial for an understanding of the dynamics of any ecosystem in which they are found. An interaction between humans and their environment does exist. Human strategies for survival are shaped to a certain extent by the production levels and structural diversities of the ecological environment. At the same time, the availability of ecological resources affects patterns of movement, land use and social aggregation which vary through time under conditions of environmental stress.²⁶⁷

264. IGGAD: *Heads of State Deliberate*, RESOURCES, 1993-II, at iii; see also Anders Rapp, *Why Do We Need A Scientific Analysis Of Dryland Degradation In Africa?*, in LAND MANAGEMENT AND SURVIVAL 109, 111 (Anders Hjort ed., 1985).

265. Amuyunzu, *supra* note 14, at 25.

266. *Id.* at 26.

267. *Id.* at 23; see also Rugumayo & Onyango, *supra* note 179, at 16.

The Convention acknowledges the merit of this approach, calling on the Parties to "adopt an integrated approach addressing the physical, biological and socio-economic aspects of the processes of desertification and drought."²⁶⁸ Unfortunately, it is short on specifics, and thus fails to provide the Parties with any meaningful guidance. In the context of socio-economic causes of desertification, I would suggest that the Parties focus on land tenure issues, the role of women in land preservation, the need to develop alternative energy sources, and implementation of effective population programs.

1. Land Tenure

Many dryland nations are characterized by land tenure arrangements antipathetic to private ownership and transfer of land interests. This includes state ownership with accordance of leasehold rights for a limited period of time, communal ownership by members of a designated group, and open access tenure, in which no one owns the land or can control access.²⁶⁹ These methods of allocating property interests are counterproductive from the standpoint of engendering sound land management practices. Tenant farmers, for example, have little interest in the long-term productivity of the soil since they often are compelled to vacate the land they occupy after a few years.²⁷⁰ Thus, they are usually chary to make the capital or labor commitments necessary to protect the land from factors such as wind and water erosion.²⁷¹ Communal land arrangements often result in the "tragedy of the commons," which again obviate the incentive of implement conservation practices:

[I]f ownership is not defined and security of tenure assured, land owners do not have the incentive to conserve and improve communal land [e.g. soil erosion control]. However, they impinge on each other on the basis of pursuing long term economic interests that, collectively, they might be better off if they could be restrained, but no one gains individually in self-restraint . . . This scenario, which Hardin so vividly characterised as the 'tragedy of

268. Convention, *supra* note 19, art. 4(2)(a); *see also id.* art. 5(c) (calling on affected Parties to "address the underlying causes of desertification and pay special attention to the socio-economic factors contributing to desertification processes").

269. DIXON ET AL., *supra* note 7, at 242-43.

270. Okpara & Salau, *supra* note 48, at 189.

271. SECRETARIAT OF THE UNITED NATIONS CONFERENCE ON DESERTIFICATION, *supra* note 31, at 281. Secure title to land also facilitates the utilization of land as collateral to obtain necessary capital to implement land protection measures. Otto T. Solbrig & Michael D. Young, *Toward a Sustainable and Equitable Future For Savannas*, ENV'T, Apr. 1992, at 6, 33.

the commons,' is often presented as the classic illustration of the predator form of human behaviour and the core of the problem of degradation on common property resources which is enshrined in traditional tenurial systems.²⁷²

The Convention is, thus, probably doomed to failure unless dryland nations make a substantial commitment to reforming real property laws so as to provide some security of land tenure.²⁷³ Reform of this nature will not be easily effectuated. Institutional land reform will likely be resisted in many dryland nations, where government and corporate elites derive power and wealth from the status quo. Donor nations should condition desertification funding on real commitments to land reform. Additionally, dryland nations should encourage sound land conservation practices by conditioning land tenure security on compliance with sound land management practices. This approach has been adopted by the Australian government.²⁷⁴

2. The Role Of Women In Land Conservation

As the drafters of both Agenda 21 and the Convention recognized, women play a critical role in land management in developing nations.²⁷⁵ Women play a predominant role in the production of food crops, producing ninety to ninety-five percent of the crops in Africa, are responsible for a large proportion of animal husbandry, and collect the vast majority of fuelwood.²⁷⁶ Thus, any effort to address the root causes of desertification must actively engage women in the process. As one commentator noted, "the energy and skills of women as natural resource managers may be a decisive factor in the battle against land degradation."²⁷⁷

Unfortunately, many developed nations actively degrade the role of women in the context of land, denying them security of tenure, access to credit, and educational services.²⁷⁸ Affected Parties to the Convention should strive to improve the lot of women in several ways. First, the laws in many developing nations need to be reformed to permit women

272. NSIAH-GYABAAH, *supra* note 22, at 90 (citations omitted).

273. Ståhl, *supra* note 36, at 507.

274. Solbrig & Young, *supra* note 271, at 15.

275. See UNCED PROCEEDINGS, *supra* note 8, para 12.56(d), at 207; Convention, *supra* note 19, preamble & art. 5(d).

276. WORLD RESOURCES INSTITUTE, WORLD RESOURCES 43 (1994).

277. *Reiterating the Role of Women in Desertification*, ECO, June 10, 1994, at 2.

278. *The Workshop 'Listening To The People': Social Aspects of Dryland Management*, 24 DESERTIFICATION CONTROL BULL., 7 (1994).

to inherit land, and to provide for daughters and single women to hold title to land.²⁷⁹ Second, credit policies which often deny women access to capital, or exact exorbitant interest payments, need to be eliminated. The FAO has estimated that women receive ten percent or less of all agricultural credit, even when they are the sole breadwinners.²⁸⁰ As a consequence, women are unable to invest in sounder agricultural practices, purchase technologies to reduce demand for fuelwood, or gain access to timesaving equipment, which would make it easier to them to concentrate on sound land management.²⁸¹ Third, efforts should be made by dryland governments to target land management training programs to women. This will require the reorientation of extension agencies in many nations which almost exclusively direct their services at men.²⁸²

Unfortunately, any efforts to improve the lot of women in this context will likely be met with substantial resistance by entrenched patriarchal interests. For example, in Gambia, international agencies sought to challenge male control over irrigation systems by funding women's horticultural projects. While the program was initially successful, male landholders are now seeking to destroy vegetable plots planted by women by planting trees that choke off sunlight. The long-term objective is to reclaim the land from the women when their crops are no longer viable.²⁸³ Similarly, in Bangladesh, women have availed themselves of government rural credit programs to fund various agricultural enterprises. Male village elders have sought to thwart these projects by establishing councils that threaten and intimidate women.²⁸⁴ Again, donors should condition aid on a commitment by dryland nations to assist women with protecting their land interests and instituting effective conservation practices.

279. MICHAEL PAOLISSO & SALLY W. YUDELMAN, *WOMEN, POVERTY AND THE ENVIRONMENT IN LATIN AMERICA* 27 (1991); see also FOOD AND AGRICULTURE ORGANIZATION & SWEDISH INTERNATIONAL DEVELOPMENT AGENCY, *RESETTING THE BALANCE: WOMEN AND FOREST RESOURCES* 6 (1991).

280. WORLD RESOURCES INSTITUTE, *supra* note 276, at 51.

281. *Id.*

282. FOOD AND AGRICULTURE ORGANIZATION, *AGRICULTURAL EXTENSION AND FARM WOMEN IN THE 1980S* 42 (1993); Jonathan Power, *To Control Population Growth, Help Women*, VANCOUVER SUN, Sept. 12, 1994, at A10.

283. Judith Carney, *Converting the Wetlands, Engendering the Environment: the Intersection of Gender with Agrarian Change in the Gambia*, 69 *ECON. GEOGRAPHY* 329, 332 (1993).

284. *Backlash*, *ECONOMIST*, Oct. 22, 1994, at 42.

3. Energy Resources

The felling of trees in developing nations to meet energy needs is one of the primary causes of desertification.²⁸⁵ A commitment to energy initiatives that will relieve the pressure on forest resources should thus also be a focal point of the Parties to the Convention. The development of alternative energy sources should be an important component of such efforts. Possible funding for such programs include the African Development Bank, which has expressed a commitment to alternative energy programs.²⁸⁶

Sun-drenched Africa would appear to be a logical place to develop a substantial solar energy infrastructure. A serious constraint, however, is the cost disparities between solar energy and traditional fuels. Currently, solar-generated electricity costs approximately 25 cents/kilowatt-hour, five times higher than electricity produced from resources such as coal and other fossil fuels.²⁸⁷ However, this gap has dropped substantially in the past decade, with the cost of solar power generation declining by two-thirds.²⁸⁸ Moreover, researchers at one major utility believe that they may be able to produce electricity through solar voltaics for as little as 5.5 cents/kilowatt-hour within two years.²⁸⁹ The economies of scale attendant to large scale production of solar energy equipment will also push prices down substantially.²⁹⁰

Some proponents of solar power programs in developing nations envision the establishment of small-scale power plants which would meet the demands of remote rural areas. Excess energy not utilized by local communities could be placed on a national grid and utilized in major urban areas.²⁹¹ This could prove to be tremendously beneficial in many industrialized centers of Africa which are currently plagued by power shortages.²⁹² Alternatively, setting up much smaller solar photo-

285. See *supra* notes 53-71 and accompanying text.

286. National Trade Data Bank, *Africa — Electric Power Systems*, MARKET REP., Oct. 21, 1994, available in LEXIS, Itrade Library, Mktprt File.

287. *Pacific Power Brings Solar Energy to Bend's High Desert Museum*, PR NEWSWIRE, Dec. 20, 1994, available in LEXIS, News Library, Pnews File.

288. *Can Enron Make Solar Compete?*, ENERGY CONSERVATION NEWS, March 1995, available in LEXIS, News Library, Curnws File.

289. *Id.*

290. Matthew L. Wald, *Thirst New Solar Cells Drink in the Sun's Energy*, N.Y. TIMES, Dec. 4, 1994, at 10.

291. Senthil Ratnasabapathy, *Greenpeace Says Solar Energy Can Meet All Our Needs*, INTER PRESS SERVICE, Sept. 15, 1994, available in LEXIS, News Library, Inpres File.

292. *Africa: Lights Out As Supply Fails To Match Demand*, AFR. ECON. DIG., Aug. 29, 1994, available in LEXIS, World Library, Txtlne File.

voltaic systems for individual rural households has proven successful in rural areas of Sri Lanka, Indonesia, and the Dominican Republic.²⁹³

Wind power may also be a viable source of energy in some dryland nations. Again, while the cost of power generated from this source is currently higher than from traditional sources, they have declined substantially in recent years and probably will continue to do so as demand expands.²⁹⁴

The introduction of energy efficient technologies may also help to reduce pressure on fuelwood supplies in dryland nations. For example, efficient fuelwood stoves, which provide an alternative to cooking on an open flame, can result in wood savings of at least 50 percent.²⁹⁵ Research into improved methods of utilizing charcoal may also help to slow down rates of deforestation.²⁹⁶

4. Population Control

Population pressures in dryland nations have contributed substantially to the desertification crisis. Moreover, with population growth rates of three percent to 3.5 percent annually, many dryland nations can expect their populations to double in just twenty-three years, exacerbating land degradation trends.²⁹⁷ The Parties to the Convention can help to put the brakes on population growth rates in several ways.

First, expenditures for population control programs should be substantially increased. As one study recently concluded: "A country's contraceptive prevalence rate — the percentage of married women of reproductive age who use any method of contraception — largely determines its total fertility rate."²⁹⁸ The dramatic results achieved by Bangladesh and Indonesia attests to the potential efficacy of family planning programs. In Bangladesh, an intensive family planning program

293. Shirene Shan, *Developing Countries: Adequacy of Power Supply 'Vital,'* BUS. TIMES, July 19, 1994, available in LEXIS, News Library, Busdtl File. Of course, the use of non-polluting alternative energy sources such as solar would provide ancillary benefits, including the reduction of carbon dioxide emissions which contribute to the "greenhouse effect," as well as emissions which contribute to urban smog and acid rain. *Id.* Additionally, indigenous production of alternative energy equipment in the developing world could generate thousands of jobs. German Information Center, *Switching to Non-Nuclear Energy Sources Would Create Jobs, Not Destroy Them, Study Says*, WEEK IN GERMANY, Dec. 9, 1994, available in LEXIS, World Library, Wkgerm File.

294. *Netherlands: Energy Company Mulls 'Green Power' Plan*, FINANCIEELE DAGBLAD, Dec. 29, 1994, available in LEXIS, World Library, Txtlne File.

295. NSIAH-GYABAAH, *supra* note 22, at 182.

296. *Id.*

297. EARTHACTION, ACTION ALERT NO. 2, POPULATION 2 (1994).

298. *Population: Contraceptives Not Capital — Slows Growth*, INTER PRESS SERVICE, Nov. 19, 1993, available in LEXIS, News Library, Inpres File.

has increased contraceptive use from 19.1 percent to 45.1 percent in the last ten years. As a consequence, the average number of children has declined from more than seven to fewer than four per woman in less than twenty years.²⁹⁹ In Indonesia, fertility rates have dropped fifty percent in the past two decades. Family planning efforts have increased the use of contraception devices to fifty-five percent.³⁰⁰

Unfortunately, two out of three women in the developing world who would like to avail themselves of family planning have no access. The number denied access is at least 120 million.³⁰¹ The UN Fund For Population Activities has estimated that it would cost only eleven billion dollars annually, approximately double current expenditures, to make contraception universally available.³⁰² Put in perspective, this is one-one hundredth of annual global expenditures on armaments.³⁰³ Effective family-planning programs could stabilize the world population at 9.5 billion, 4.3 billion less than current trends will produce.³⁰⁴ While many developed nations attending the U.N. Population conference in 1994 pledged to increase funding for population control programs,³⁰⁵ it now appears likely that the United States will actually slash its expenditures for such programs by \$500 million annually, depriving twenty five to sixty million individuals in developing nations of contraceptives.³⁰⁶ It is unlikely that developing nations will be able to substantially increase expenditures for family planning in the next decade.³⁰⁷ Thus, developed nations must be encouraged to invest in such programs; this is clearly in the best interest of both developed and developing countries in the long term.

299. Pastor B. Sison, *Bangladesh Succeeds With Family Planning*, N.Y. TIMES, Oct. 6, 1994, at A28 (letter to the editor from Pastor B. Sison, Public Affairs Consultant, World Bank); see also *Contraceptive Prevalence Rate in Bangladesh Doubles*, XINHUA NEWS AGENCY, Oct. 23, 1994, available in LEXIS, News Library, Xinhua File.

300. *Indonesian Fertility Rate Drops 50% in 20 Years*, XINHUA NEWS AGENCY, Jan. 13, 1995, available in LEXIS, News Library, Xinhua File.

301. Elizabeth Buie, *UN Backs Birth Control As A 'Right,'* THE HERALD (Glasgow), Aug. 18, 1994, at 11. By the end of this decade contraceptive services will need to be made available to an additional 100 million women, just to keep pace with population growth. *Avoiding A Doomsday Scenario*, GUARDIAN, Sept. 3, 1994, at 22.

302. EARTHACTION, *supra* note 297, at 2; Weld, *supra* note 54, at A9.

303. Weld, *supra* note 54, at A9.

304. McNamara, *supra* note 99, at 12.

305. Deborah Zabarenko, *After Cairo, Surprising Momentum On Population*, REUTERS, Oct. 23, 1994, available in LEXIS, News Library, Reuwlid File.

306. Ben Barber, *USA: Republicans' Stand Threatens Baby Boom*, SUNDAY AGE (Melbourne), Jan. 15, 1995, available in LEXIS, World Library, Txtlne File.

307. George Moffett, *The Population Clock Keeps Ticking After Cairo*, CHRISTIAN SCI. MONITOR, Nov. 9, 1994, at 7.

Second, research consistently indicates that raising educational levels for women lowers reproductive rates by "affecting the age at which unions first form and the number of children they have."³⁰⁸ According to the World Bank, women denied a secondary education have an average of seven children; this figure drops to three if they receive secondary instruction.³⁰⁹ Higher education rates also reduce infant mortality rates, which can ultimately contribute to lowered birth rates. The United Nations estimates that each year of education received by a young mother reduces the death rate of her children by seven percent.³¹⁰

Unfortunately, women's educational levels are abject in many developing nations. Of the 960 million illiterate individuals in the world (most of whom are in the developing world) two-thirds are women.³¹¹ In many developing nations, religious customs and patriarchal institutions deny women educational opportunities and ensure unchecked population growth.³¹² Thus, the prospects for enhancing the status of women is contingent on a meaningful commitment by affected Party governments to achieve gender equity.

Finally, increasing security of land tenure, discussed earlier in this article,³¹³ might yield the ancillary benefit of reducing population growth rates. A recent study indicates that in nations where private land rights are weak there is an incentive to have more children because they can be sent out to "capture" open-access resources such as firewood, animal fodder, grazing, and fish.³¹⁴ Handwerker observes that "when children are resources, parents can improve or maintain their material well-being only if they maximize fertility or completed family size."³¹⁵ Private

308. *Recommendations of the Latin American and Caribbean Regional Conference on Population and Development*, 19 POPULATION & DEV. 885 (1993).

309. *Battle of the Bulge*, ECONOMIST, Sept. 3, 1994, at 25; see also Johanna Son, *Pakistan-Women: Education Begins Breaking Down the Barriers*, INTER PRESS SERVICE, Sept. 27, 1994, available in LEXIS, News Library, Inpres File; Eriko Wada, *India's Women Facing Obstacles in Differences*, DAILY YOMIURI, Oct. 7, 1994, at 4.

310. *Birthrates and Earth's Fate*, BOSTON GLOBE, July 10, 1994, at 72.

311. Storer H. Rowley, *Population Forum Criticized for Overemphasizing Abortion; Other Important Issues Slighted*, CHICAGO TRIB., Sept. 8, 1994, at 7. In China, 70% of all illiterate adults are women. Yojana Sharma, *China-Education: State Firms' Debts Spell Troubles For Schools*, INTER PRESS SERVICE, Dec. 22, 1994, available in LEXIS, News Library, Inpres File.

312. Khaled Dawoud, *Rural Sex Education Frustrated By Ignorance*, GUARDIAN, Sept. 3, 1994, at 10.

313. See part IV.D.1, *supra*.

314. *Population Misconceptions*, ECONOMIST, May 28, 1994, at 84.

315. W. Penn Handwerker, *Women's Power and Fertility Transition: The Cases of Africa and the West Indies*, 13 POPULATION & ENV'T 55, 59 (1991).

ownership of property, by contrast, may vitiate this view of children as an economic resource to some degree.³¹⁶

E. *Emphasis On Local Decisionmaking And Empowerment*

A final significant aspect of the Convention is its recognition of the importance of participation by groups and individuals at the local level in affected nations.³¹⁷ Implicit in the Convention's approach is a commitment to decentralization, defined as:

[T]he transfer of responsibility for planning, management, and the raising and allocation of resources from the central government and its agencies to field units of central government ministries or agencies, subordinate units or levels of government, semi-autonomous public authorities or corporations, area-wide, regional or functional authorities, or nongovernmental private or voluntary organizations.³¹⁸

Decentralization can be critical to the success of the Convention for several reasons. First, programs reflecting the "top down" concept, whereby programs are formulated at an aggregate decisionmaking level (such as a government ministry or donor organization), often fail "because local circumstances vary greatly over time and space. The informed, key decision-makers are the farmers and pastoralists themselves."³¹⁹ For example, the giant Bura project on the Tana River in Kenya, sponsored by the Government of Kenya and the World Bank, failed to take into account local cultural and economic conditions. As a consequence, the introduction of cash-crop based economy disrupted local patterns of land use and employment patterns. The project's woes were exacerbated because local institutions had not been brought into the process; thus, they were unable to address the problems in an effective manner.³²⁰

Failure to apprise local residents and groups of the rationale for development and conservation programs also engenders resentment and misunderstanding of program objectives. For example, in the 1940s

316. *Population Misconceptions*, *supra* note 314, at 84.

317. Convention, *supra* note 19, arts. 3(a), 5(d), 10(e).

318. Harlan Hobgood, *Sahel Decentralization Policy Rpt.* (Vol. II): *Facilitating Transitions from Centralized to Decentralized Politics I-2* (Apr. 1992) (on file with the *Michigan Journal of International Law*).

319. JOHANNES KOTSCHI ET AL., *TOWARDS CONTROL OF DESERTIFICATION IN AFRICAN DRYLANDS: PROBLEMS, EXPERIENCES, GUIDELINES* 28 (1986); *see also* CARLEY & CHRISTIE, *supra* note 79, at 159.

320. ANNORBAH-SARPEI ET AL., *supra* note 59, at 8-9.

in Zimbabwe, the government's Natural Resources Board sought to mandate that local people build contour ridges to protect the soil. While this may have been a sound program to combat desertification, it encountered substantial resistance because it was viewed as an imperialistic edict of the colonial government. The failure of the program was primarily attributed to a failure to develop local conservation committees and to educate the public as to the objectives of the program.³²¹ Similarly, in Burkina Faso, a large-scale anti-erosion project failed abjectly because farmers neither understood the objectives of the project nor were educated on how to participate.³²²

By contrast, projects that emphasize the active participation of local people in the planning and implementation of conservation programs have proven to be far more successful. For example, the ORAP initiative in Zimbabwe, a mass movement of over half a million rural people, has contributed positively to anti-desertification efforts in that nation. ORAP educates local populations about environmental issues, including soil and water resources, through culturally appropriate means, including drama troops. It also emphasizes self-reliance and community-based programs to facilitate local control of development activities.³²³ Similarly, in India and Ethiopia, community-based afforestation projects have also proven extremely successful.³²⁴

However, if community-based programs and devolution of authority to local peoples are to prove viable, efforts must be made to improve the dissemination of information in local languages, especially to the illiterate, and to make extension services more widely available.³²⁵ In many developing nations, such programs are so severely underfunded that extension staff "lack transport, daily, allowances, instruction materials and access to recent research findings. Often they sit demoralized in resource-starved offices."³²⁶ International donor agencies and nongovernmental organizations should also seek to develop "action-oriented networks," where large centralized entities seek to develop direct relationships with localized agencies and individuals, which bypasses bureau-

321. *Id.* at 10.

322. KOTSCHI ET AL., *supra* note 319, at 28.

323. ANNORBAH-SARPEI ET AL., *supra* note 59, at 11.

324. DIXON ET AL., *supra* note 7, at 56; Field, *supra* note 64, at 51.

325. NSIAH-GYABAAB, *supra* note 22, at 175; see also *Secretary General of the United Nations Conference on Environment & Development, Preparations for the United Nations Conference on Environment and Development on the Basis of General Assembly Resolution 44/228 and Taking Into Account Other Relevant General Assembly Resolutions*, U.N. Doc. A/CONF.151/PC/100/Add.17 (1992).

326. Ståhl, *supra* note 36, at 507.

cratic hierarchies and engendering an understanding of conditions at the most elemental level of decisionmaking.³²⁷

National and international authorities may also resist efforts to dispense with the "top down" approach because of the attendant loss of control and power. As Thomson concludes:

The upshot of the national government's pretensions in multiple public arenas has been to engender citizen passivity. With few exceptions created by recent reforms, transactions costs of obtaining the proper authorizations to obtain land, or to organize an association, or to create a local government capable of making and enforcing rules remain at prohibitive levels. They dissuade people from acting to deal with problems in their communities that they both recognize and know how to solve. The costs of obtaining legal authorization to act simply outweigh the benefits to be gained. Corruption often increases costs of obtaining approvals, as officials bargain with citizens for access to goods and services the latter need in order to survive ³²⁸

In recognition of this, efforts must be made to channel funds directly to the local level and to help engender the development of localized infrastructures to conduct anti-desertification efforts.

CONCLUSION

The importance of the world's dryland regions cannot be overestimated. As the United Nations averred:

The dry lands under threat must be seen for what they are, the home of one-sixth of the world's population and although they are regions of low productivity per unit of area, their total production is enormous, especially of meats, cereals, fibres and hides. Under proper management, the dry lands have an even greater potential for production. The problem of supplying everyone with adequate food, shelter and clothing is now recognized as urgent and a problem that will increase in difficulty as the world's population continues to expand. Efforts to resolve this problem with anything less than the enormous total output of the dry lands would have little

327. See CARLEY & CHRISTIE, *supra* note 78, at 171-73.

328. See James T. Thomson, *Sahel Decentralization Pol'y Rep.* (Vol. III): *Legal Recognition of Community Capacity for Self-Governance: A Key to Improving Renewable Resource Management in the Sahel* 3 (Jan. 1994) (on file with the *Michigan Journal of International Law*).

prospect of success. The agricultural potential of the drylands is essential to the welfare of mankind, and their conservation is accordingly of global concern.³²⁹

Unfortunately, if current trends continue, the world's drylands are doomed to become steadily more barren and less productive, with disastrous global implications. The Convention to Combat Desertification may offer a means to avert this disaster; however, it will only prove efficacious if both developing and developed nations dedicate themselves to the kinds of dramatic reforms that they have eschewed in the past. The ultimate success or failure of the Convention may speak volumes as to the future viability of international environmental agreements.

329. SECRETARIAT OF THE UNITED NATIONS CONFERENCE ON DESERTIFICATION, *supra* note 31, at 8.