

Foreword



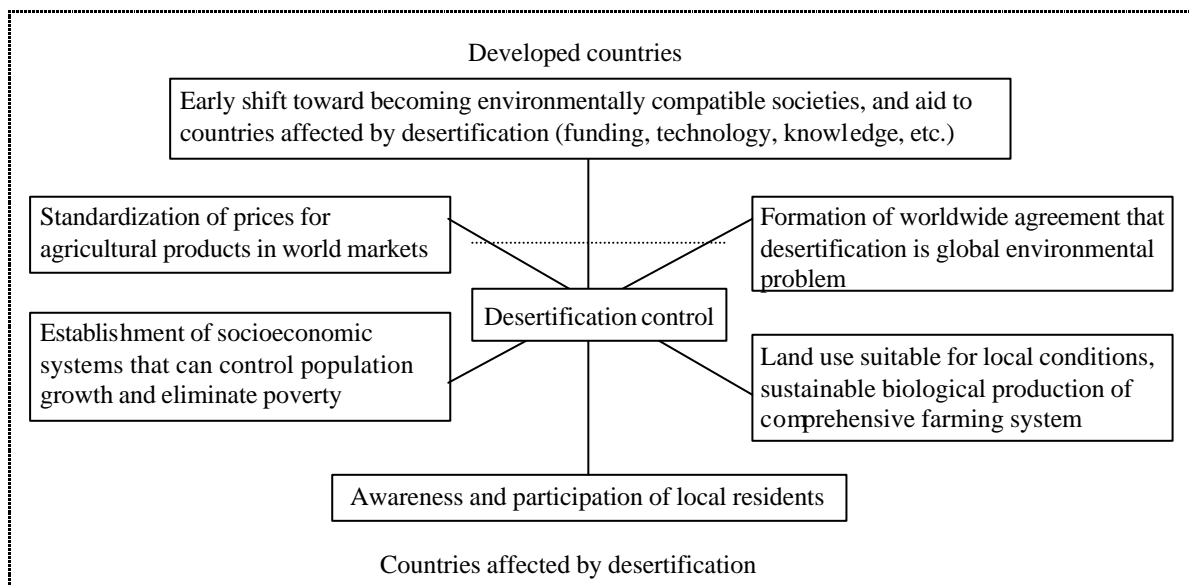
The earth dates back 4.6 billion years. People first appeared on the earth about five million years ago and started engaging in agriculture only about ten thousand years ago. Afterward, the earth's population began to grow, increasing from about 300 million at the time of Christ's birth to 1.6 billion by the end of the nineteenth century. And in the twentieth century, the population has shown explosive growth, with approximately 5.9 billion people now inhabiting the earth. Most of the noticeable increase during this time has not been in the developed countries but in the developing countries. This vigorous growth in the population is expected to continue in the twenty-first century as well. The rapid rise in the population is attributable to the development of science and technology and the accompanying consumption of vast amounts of natural resources and energy. One of the major environmental problems facing the earth, that of the desertification of Arid Lands, is also a result of this background. That is, in order to support the earth's ever-increasing population, farmland acreage has been expanded without regard to climatic conditions, and land has been subjected to harsh treatment from overgrazing and unsuitable farmland management. Consequently, crop productivity has dropped dramatically. Already, twenty percent of the world's Arid Lands are seeing the effects of desertification, and each year land the size of Kyushu and Shikoku combined is turning into desert.

What can be done to prevent the desertification of arid lands? First, to support a continuously growing population, it is important to establish high-productivity agriculture that is suitable for the local climate and customs. The foundation lies in the cultivation of plants. Seventy to ninety percent of plant weight is water. In a single day, a plant will transpire from one to ten times its weight in water. Plants can thus be thought of as large consumers of water. Using water and carbon dioxide as raw material, plants grow by producing organic matter through photosynthesis. Light from the sun is indispensable for photosynthesis. When sunlight is received, heat is also received. Inside the plant the photosynthetic process begins, with various chemical reactions taking place and a number of substances synthesizing and decomposing. What supports this action is enzymes. If sunlight is received and the temperature of the plant continues to rise, the enzymes become less active, the chemical reactions eventually stop, and the plant dies. To prevent this from happening, plants diligently transpire to lower their temperature. The amount of transpiration is greater in locations such as the desert, where the sun is strong and the air is dry. In other words, to grow plants in arid lands requires the consumption of greater amounts of water than in humid regions. Thus, when cultivating plants in arid lands, it is important to efficiently collect the little rain that falls, to curtail the amount of water taken from rivers and from underground, and to prevent moisture losses from water channels, ground surface, and plants so that the water is effectively used to help plants grow. Using this as a foundation and then knowing the customs and climate of the area, establishing a use plan, selecting suitable types of plants, developing technology that raises the productivity per unit of land area, and creating a sustainable agricultural system will lead to the establishment of high-productivity agriculture.

There are a number of individual technologies that are useful in combating desertification. For grazing lands, it is important to graze a number of livestock that fits the land's capacity to produce vegetation in order to avoid overgrazing. One effective way to utilize the amount of vegetation produced by the pastureland is to adopt rotational grazing, whereby grasslands are divided into sections and livestock graze in each section for a certain period of time before moving to the next section. In places where farming and livestock-farming are carried out

together, the use of the unused parts of crops as livestock feed can be an effective way to prevent overgrazing. Improvements in livestock feeding efficiency are also essential. For rainfall-dependent farming, it is important to comprehensively arrange cultivated fields, grasslands, and woodlands to match the natural conditions of the land in order to prevent soil erosion and to effectively utilize rainwater. The placement of trees and hedges as windbreaks and, in relatively rainy areas, the planting of green manure crops, such as beans, are useful methods to prevent the erosion of idle fields. Such actions also maintain soil fertility and soil water retention. Effective ways to prevent water erosion on slopes include the construction of terraces to prevent rainwater run off, and the adoption of contour farming and ridge plowing. A planting system that shortens the period in which land is bare can be useful in controlling wind and water erosion. Crops rotation is an effective way to maintain soil fertility and water retention. The adoption and breeding of drought-resistance crops and species is also needed. In irrigation farming areas, it is important to install culverts and other drainage equipment, prevent leakage from irrigation channels, and maintain drainage channels. And when irrigating, it is important to provide the proper amount of irrigation to prevent the groundwater level from rising, which causes salt deposition. Breaking up soil hardpan created by the use of large tractors is also useful in preventing salt deposition. Covering the surface of the soil with straw or vinyl mulch will reduce surface evaporation, which will in turn reduce salt deposition. If salt deposits form, they should be washed away with water while still small. Furthermore, it is important to adopt and breed salt-resistance crops and species.

Humans are the ones who can prevent the desertification of farmland in arid lands. And it is humans who will hand down the land to their descendants. The land must therefore be maintained as an attractive economic foundation for people. For this purpose, agricultural goods that are produced must be sold fairly in international markets, and the prices for such goods must satisfy those who produce them.



Comprehensive Measures to Combat Desertification

Only if this happens will the aforementioned individual technologies and sustainable agricultural systems prosper. For people who live in developed countries, elevating the will of farming people to produce can lead to stable supplies of agricultural products into the future. But at the present time, people who are engaged in

agriculture in arid lands affected by desertification are suffering from poverty even as their populations show phenomenal growth. It is thus important to support the establishment of socioeconomic systems that can eliminate poverty and control population growth, since such systems are lacking in many of the countries that are shouldering problems with desertification. To establish such systems, aid from the developed countries is vital. It thus became desirable to quickly form an agreement among the international community to regard desertification as a global environmental problem. This desire led to the Convention to Combat Desertification, which was ratified by the United Nations in 1994.

The objective of the UN Convention to Combat Desertification is to “prevent the desertification of countries, particularly African countries, that are seriously affected by desertification and to ease the effects of drought through international coordination and cooperation.” Countries affected by desertification are obligated to “give priority to combating desertification and easing the effects of drought; appropriate as much money as possible to these activities; take steps to control population growth and poverty, which contribute to desertification; facilitate participation by local residents, particularly women and young people, in activities aimed at combating desertification; and prepare and implement action plans to combat desertification.” Of these obligations, it is particularly important for women and young people to be aware of the desertification problem and to participate in its solution, because they hold the key to keeping population growth in check. The trend toward fewer children, a major factor behind population control in the developed countries, has enabled people to enjoy material wealth. Education has produced an increasing number of self-sufficient women, resulting in later marriages and an increase in the number of unmarried people. The Convention also obligates the developed countries to “support countries affected by desertification in their efforts to combat desertification and ease the effects of drought, and support the preparation of action plans; provide sufficient funding to ensure that desertification control plans materialize; and promote technical and scientific assistance to combat desertification.” As one of the developed countries, Japan has started providing financial, technical, and scientific assistance in accordance with the Convention. The Arid Dome, which was completed at the Tottori University Arid Land Research Center and which is equipped with some of the world’s most advanced research equipment, is a part of Japan’s assistance. The Arid Dome will play a role in supporting research being conducted locally in arid lands overseas. In short, since overseas research sites lack large testing facilities and equipment, as well as the electricity and gas to run them, the Arid Dome will have the responsibility of receiving survey data from the sites and then sending the analysis results back to the sites via communications satellites and other networks. The Arid Dome will also be utilized for basic research and human resources development required to combat desertification. This laboratory facility will be open for use by researchers from throughout the world, and is expected to become a center for international joint research.

If we wish to travel the road toward solving the desertification problem, we must first take comprehensive steps such as those described in this report.

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