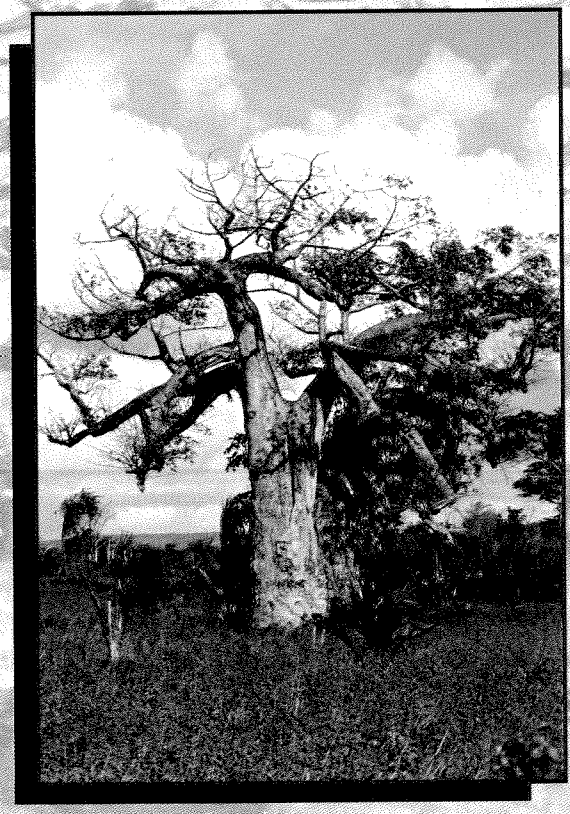
Special Report

The ENVIRONMENT

U.S. Agency for International Development



Managing Natural Resources for Sustainable Development

Reaching for a Better Environment

The face of the planet is scarred by receding tropical forests, eroded croplands and advancing deserts. The health of man is threatened by indiscriminate pesticide use, industrial and urban pollution and inadequate or unsafe water supplies. The protection of the environment and wise and sustainable use of natural resources are fundamental to human survival. They also are essential to the process of economic growth and development.

The world has witnessed the tragic impact of environmental degradation and famine in Africa. Deforestation, soil erosion and desertification have contributed significantly to increasing sub-Saharan Africa's vulnerability to drought and to undermining its agricultural productivity.

The mandate of development agencies is to help find solutions to problems such as these. The U.S. Agency for International Development (USAID) takes pride in its achievements in integrating environmental and natural resource concerns into the development planning process of the U.S. foreign assistance program and in its efforts to promote sound environmental practices abroad.

In the last decade, USAID pioneered in forging the link between environment and development. In the years ahead, the effort to apply human knowledge to make economic development a process that not only sustains, but also enriches the Earth's natural heritage will be no less intense.

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Special Report

The ENVIRONMENT

U. S. Agency for International Development

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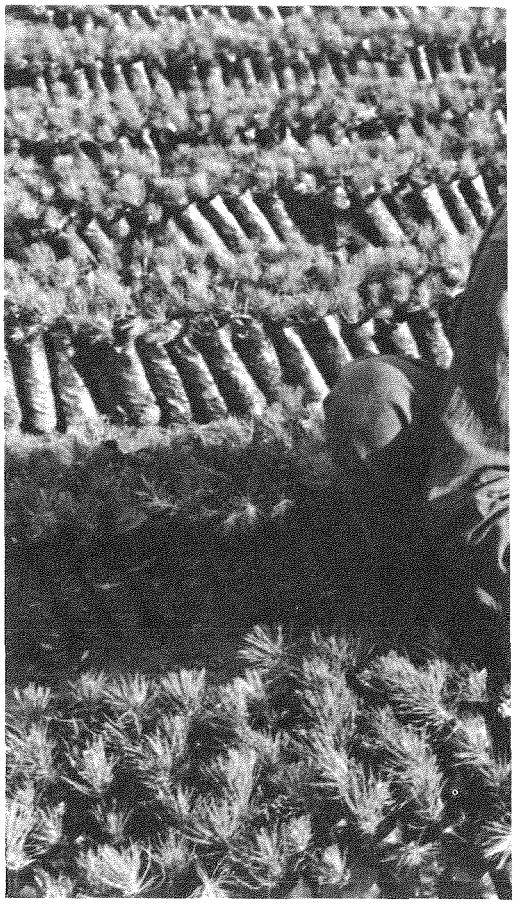
Meeting Today's Challenge



The U.S. Agency for International Development (USAID) has taken a leadership role in integrating environmental concerns into development programs.

"Our objective is to enable developing countries to become self-reliant in identifying and solving their environmental problems," says Nyle Brady, senior assistant administrator for the Bureau for Science and Technology. USAID's programs address a wide range of related issues and support training, research and institutional development to further environmental and natural resource management.

Nearly $120 million is provided each year through the U.S. foreign aid program for activities aimed at preserving and sustaining the natural resource base in developing nations.

USAID also ensures the environmental integrity of its own programs. Since 1976, no U.S. development project has been authorized for funding until its impact on the environment has been studied and measures adopted to ensure its environmental soundness. USAID encourages other donors to adopt similar policies.

Because human survival depends on a sound natural resource base and because sustained development is impossible without securing and guaranteeing the protection of the planet's natural heritage, the environment is a crosscutting issue and increasingly a part of every development activity.

The U.S. foreign assistance program recently has taken actions to preserve biological diversity, protect tropical forests, meet the fundamental needs of sustained development in Africa and improve efforts in the fields of environmental health and pesticide management.

The success of environmental programs in developing countries hinges on the support of governments and people. "We encourage nations to incorporate environmental concerns into the planning process for economic growth and development," says Norman Cohen, USAID's environmental coordinator. The Agency's network of regional environmental advisors, foresters and natural resource experts enable the U.S. foreign aid program to extend its "environmental dialogue" with developing nations and to build a constituency for conservation where it is needed most.

Improving Natural Resource Management

The Agency assists countries to strengthen their institutional and scientific capabilities to improve natural resource management. Strong and active institutions—both governmental and private—staffed with skilled personnel are the foundation for self-reliance and the source of both technical expertise and policy leadership for sound environmental policies and practices.

Often institution-building components are a part of ongoing projects such as the USAID-supported watershed management program that began in Panama in 1979. Through this program, Panama's National Directorate for Renewable Natural Resources (RENARE) increased its staff from 440 to 850 and launched watershed management programs in three critical areas, including the Panama Canal Zone.

"The project is continuing to

provide training for RENARE's staff in a number of fields such as park planning and management, environmental assessment, land classification techniques and soil and water management," reports Jim Hester, chief environmental officer in the Bureau for Latin America and the Caribbean.

"Within the next two years, for example, we expect that RENARE will have the ability to survey and classify 50,000 hectares of land per year and will have completed classification of 300,000 hectares," he notes.

USAID also helped prepare a strategic plan for a national park and equivalent reserve system in Panama and worked with RENARE to provide training for park personnel. "We helped set up patrol stations and administrative offices for Soberania National Park," Hester says. "Our support will enable RENARE to establish a permanent physical presence in each of Panama's 11 national parks and eight wildlife reserves. A training program in natural resource management and park protection for park and forest patrols, local government officials and community leaders soon will be set up."

In Africa, USAID's five-year Environmental Training and Management (ETMA) project is an example of a regional institution-building effort in about 14 nations.

"ETMA promoted the recognition that the environment is important and that a country's livelihood depends on the condition of the environment," says Bessie Boyd, environmental officer in the Africa Bureau.

Since the project began in 1980, 46 training sessions have been held. In the Ivory Coast, for example, seminars were conducted on the techniques of environmental assessment and on the ecological consequences of river basin development.

In Kenya, ETMA support for the National Environment Secretariat resulted in the development of 11 district environmental reports followed by district-level workshops to discuss them. National conferences on water supply and pollution control and on endangered plant resources were held. The ETMA project also set up training in a variety of disciplines, including soil management, computer operations and rare plant identification.

"Through ETMA, USAID also provided funding for water quality and pollution monitoring of Lake Victoria—the second largest lake in the world," says John Gaudet, environmental advisor in USAID's Regional Office for East and Southern Africa in Nairobi. The project supported a number of conferences and workshops and brought in overseas technical advisors to enable the Kenya-based Lake Basin Development Authority (LBDA) to conduct needed monitoring activities. USAID also supplied the necessary equipment for water quality and pollution monitoring.

"Five African countries have access to Lake Victoria," Gaudet says. "Today, all of them look to LBDA for technical expertise and leadership."

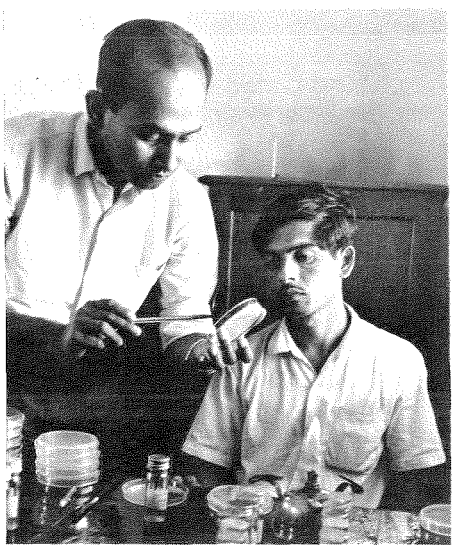
In the Sudan, ETMA focused on the Institute for Environmental Studies (IES) at the University of Khartoum. The IES was created in 1979 to conduct both training and research programs at the postgraduate level. "The institute accumulated a

base of environmental data and is able to use it for specialized environmental consulting for a number of organizations, including USAID,'' Boyd says. ''IES also provides training for primary and secondary school teachers on environmental issues and is developing teaching materials to be used in school curriculums.''

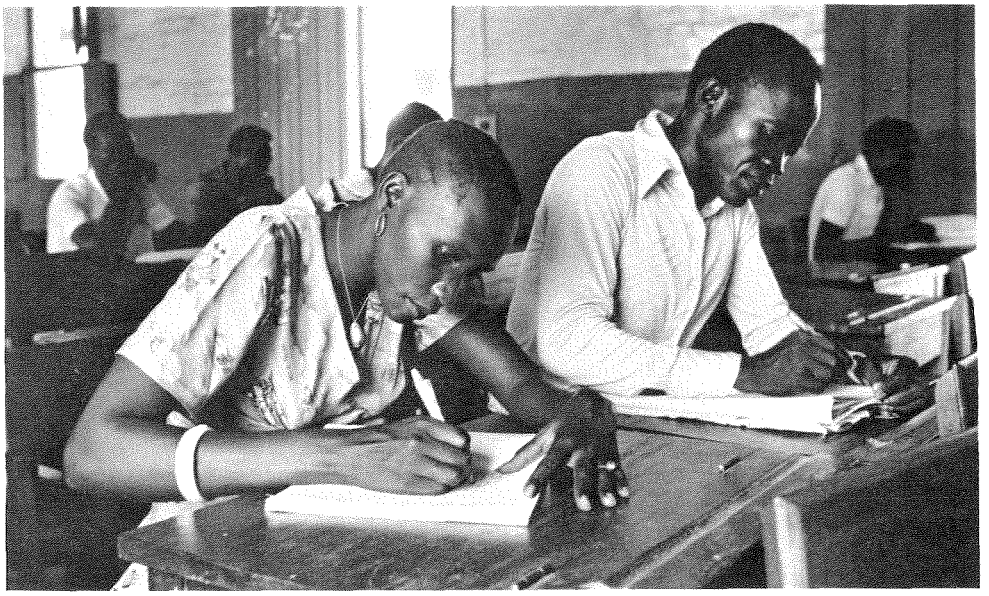
''Our concern is also to help indigenous environmental organizations to become self-reliant,'' says Stephen Lintner, environmental coordinator in the Bureau for Asia and Near East. The Environmental Problems Foundation of Turkey (EPFT) is an example. Working with the International Institute for Environment and Development (IIED), USAID supported the foundation's fund-raising efforts to minimize dependence on donors. In 1983, the EPFT was entirely dependent on donor support. Within three years, the organization was raising two-thirds of its own funds from local sources.

The success of this effort has led the foundation to consider publishing a book on how indigenous organizations can effectively raise local money, including in-kind contributions not generally considered in traditional fund-raising efforts.

USAID assistance also enabled EPFT to expand participation in an environmental dialogue by bringing together top Turkish specialists from academia and government to discuss environmental problems. A number of publications resulted, including the book *Industry and the Environment.*



Technology transfer and international research in the natural resource field are vital for sound management and planning.



Through USAID's Environmental Training and Management project, the Institute for Environmental Studies in the Sudan provides training for primary and secondary school teachers on environmental issues.

The transfer of technical knowledge and the stimulation of international research in the natural resource field are vital for sound management and planning.

Recent USAID-supported initiatives have established forestry research networks in Africa and Asia to bring together the best available scientific expertise and to translate it into active and innovative forestry programs.

For example, USAID signed an agreement in 1986 with the Nairobi-based International Council for Research in Agroforestry (ICRAF) to promote forestry research in Africa. ''ICRAF has served as a clearinghouse for information on agroforestry in Africa,'' points out Ian Morison, senior forestry research advisor in the Bureau for Science and Technology. ''Now, however, it is moving more toward implementing research projects.''

As part of the new orientation, the African Research Network for Agroforestry (AFRENA) was developed. ''AFRENA operates in four regions in Africa—Southern, East, West and the Sahel,'' explains Morison. USAID supports activities in the East African nations of Rwanda, Burundi, Uganda and Kenya. Canada's International Development Research Center provides funding for Southern Africa. France supports West African programs, and the Scandinavian nations presently are considering funding AFRENA operations in the Sahel.

In the USAID-funded area, steering committees already have been formed in each of the four countries and include representatives from national forestry research institutes and government agencies. ''Our objective is networking,'' Morison says. ''We are looking at the broader picture to bring together those who are working in the same field.'' USAID is providing $4 million over a five-year period for ICRAF's AFRENA program.

In Asia, a forestry network has been set up through USAID's Forestry/Fuelwood Research and Development project. The Asian Forestry and Fuelwood Network Center is headquartered at Kasetsart University in Thailand. The center's objective is to stimulate research on the social and biological aspects of multipurpose tree species, to increase the productivity of forests and to improve the management and adaptation of new forestry technologies.

The first workshop of the network was held in September 1986 in Bangkok, bringing together over 60 forestry specialists from 12 nations.

''The center is designed to complement other research networks

USAID and the Environment: A Historical Perspective

Sustainable natural resource management is an integral part of the development programs of the U.S. Agency for International Development (USAID).

The link between conservation and development became increasingly apparent during the last decades. In fact, that interdependence was the focus of global attention during the U.N. Conference on the Human Environment, held in Stockholm in 1972.

USAID has taken specific actions to ensure the environmental integrity of its programs. Some were in response to newly enacted laws. Others were innovative initiatives to make environmental procedures a part of the policy-making process and to make those policies into practices around the world.

In 1976, the Agency developed formal environment assessment procedures that became a requirement for all relevant Agency-funded development projects. The procedure included careful review of pesticide use consistent with the 1970 National Environmental Policy Act (NEPA).

In 1977, an amendment to the 1961 Foreign Assistance Act mandated USAID to provide broad assistance in the area of environment and natural resources and specifically directed the Agency to address the problems of deforestation and desertification.

USAID responded by initiating the environmental profiles in 1979, which were to provide the first available natural resource data and analysis for a number of developing nations.

This year, USAID set up a Committee on Health and the Environment to examine opportunities for more concerted assistance to developing countries in the proper use of agricultural and industrial chemicals and processes and alternatives such as integrated pest management. A report to Congress will be presented in January 1988 on the assessed needs of developing nations and how USAID can more effectively address them.

The Agency recently completed a Natural Resource Management Plan for sub-Saharan Africa to hone priorities for achieving sustained agricultural productivity and natural resource management on the drought-stricken continent.

The plan emphasizes forestry, agroforestry, the maintenance of biological diversity, and soil and water conservation and management to arrest the effects of environmental degradation.

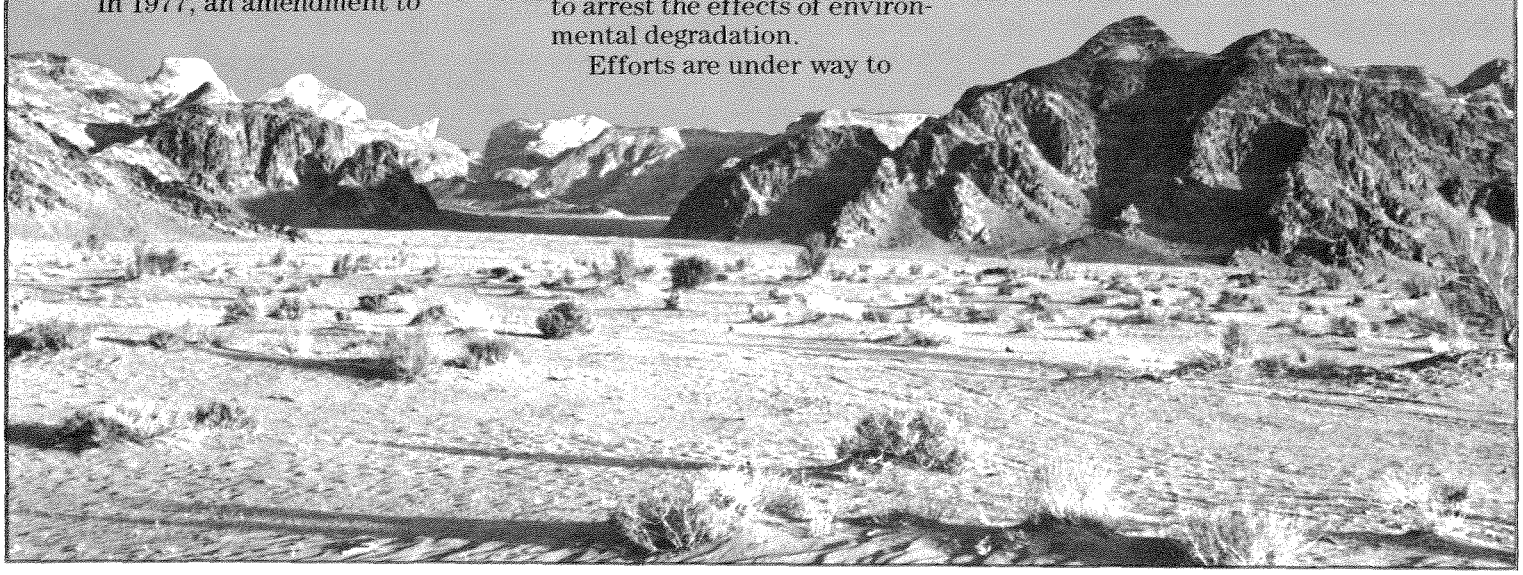
Efforts are under way to improve the focus of foreign aid programs in agriculture, rural development and nutrition throughout the developing world to integrate natural resource conservation into ongoing and future development programs.

In 1983, the Agency's policy statement on the environment reiterated the requirement of environmental soundness for U.S. foreign assistance programs and emphasized the need to promote sound environmental practices abroad.

The same year, Congress mandated that assistance be provided to developing countries to protect and maintain wildlife habitat and develop better wildlife management and plant conservation programs.

Prior to the congressional mandate, USAID had taken the lead in sponsoring the U.S. Strategy Conference on Biological Diversity in 1981, the first major effort to create a national dialogue on the subject. In 1984, USAID headed an interagency task force that prepared the U.S. Strategy on Conservation of Biological Diversity and submitted it to Congress in 1985.

The following year, USAID was further directed by Congress to help conserve tropical forests, and funds were earmarked for specific programs to preserve biological diversity.



and activities of various multilateral and bilateral agencies that assist forest development programs in Asia," says Robert Ichord, chief of the Division of Energy and Natural Resources in the Bureau for Asia and Near East.

"At Kasetsart, we are operating on three levels," notes Morison. "On the national or country level, we are inviting institutions to take part in training sessions, workshops and conferences to strengthen their capacity in forestry. We are also enhancing their capabilities to do research.

"On a regional level, we are providing opportunities for networking to share research findings on multipurpose tree species. On the global level, we are emphasizing crosscutting issues such as biotechnology and computer data base development."

USAID also supports the training of future environmental and natural resource management specialists in the United States and throughout the developing world. In 1984, for example, a master's degree program in watershed management was started with USAID funds in Costa Rica at the Center for Research and Training in Tropical Agriculture (CATIE). It now graduates seven specialists a year.

"CATIE runs a number of short courses, seminars and symposia in watershed management aimed at professionals and technical people or high-level decision makers," says Frank Zadroga, an environmental officer in USAID's regional office in San Jose, Costa Rica. "By the end of 1987, we will have conducted 21 short courses for about 500 people and 26 workshops and conferences."

Training in integrated pest management and related disciplines also is provided at CATIE. Angel Chiri, an entomology professor from the University of Maryland assigned to USAID's Central American regional office, explains that the program began about three years ago.

"Two levels of training are provided—a master's degree in integrated pest management and a program of short courses and seminars both at CATIE and on the national level in five countries," Chiri says. "We hold about five to six workshops a year in each country in a variety of fields, such as pest management, entomology, plant pathology and nematology."

Encouraging Policy Change

Environmental reviews of proposed development projects, begun in 1976 by the Agency, created an effective vehicle to conduct a dialogue with decision makers in developing nations. Policy changes resulted.

The Central Selva Resource Management Project, which began in 1982 in the jungle of Peru's Palcazu Valley, is an example.

"The government of Peru in its initial plans for the valley projected large-scale agro-industrial development, including increased colonization of an area that contained large tracts of primary tropical rain forest," explains Jim Hester.

"USAID's environmental assessment reoriented the project in favor of natural forest management as the principal activity with very limited small-scale agriculture in the area. No new colonists came to the valley. The existing inhabitants, including the Amuesha Indians, received title to their land and were legally recognized by Peruvian authorities," Hester says.

Through a subsequent loan agreement with USAID, the government of Peru designated part of the area as a national park and a protected forest. "We are assisting with the consolidation of the 1,330-square kilometer Yanachaga-Chemillen National Park and the 33-square kilometer San Matias Forest Protection Zone," he adds.

Policy changes based on USAID's environmental profiles have helped slow the destruction of forests and have encouraged environmental awareness.

The Central American Bank for Economic Integration (CABEI) now has a capability to conduct environmental assessments of its development projects as a result of an environmental review of the bank's programs. "As a condition for a loan to revitalize CABEI activities, we suggested the adoption of environmental assessment procedures by the bank and the addition of an environmental professional to the staff to monitor the environmental soundness of the

bank's projects," says Hester.

In Costa Rica, USAID was asked to evaluate the environmental impact of a rural infrastructure development project. "We determined that a 300-square kilometer wetland within the project area was ecologically important and would have been lost if the proposed project was to go forward to upgrade roads and expand rural infrastructure," Hester explains. "As a condition for the project, USAID required that the government set aside the Cano Negro area as a wildlife reserve. Local currency then was provided to help manage it."

The new wetland refuge drains to the north into Lake Nicaragua and is home to a number of threatened and endangered species, including the tapir, paca, cayman, jaguar, ocelot and the six-foot jabiru stork that—with its eight-foot wing span—is the largest stork in the world.

"We are also cooperating with the World Bank and the Asian Development Bank in conducting environmental assessments of major thermal power plants in the Sind Province of Pakistan and have provided an advisor to the Indonesian Ministry of Agriculture to help design an environmental assessment process to comply with the country's new environmental assessment law," adds Stephen Lintner.

Strengthening the Private Sector

"Private voluntary organizations are a major force both in directing their nations' environmental agendas and in promoting public education and awareness," says Nyle Brady. "We work closely with both U.S. environmental groups and indigenous organizations in developing countries to strengthen the foundation for environmental action."

Working with the World Wildlife Fund, for example, USAID is helping *Fundacion PA.NA.M.A.* to bring together Panamanian environmental organizations to create a solid non-governmental base for conservation. A number of collaborative and regional programs already are under way. In Bolivia, USAID supports a similar effort by the Environmental Protection League (LIDEMA), an umbrella organization that includes eight private environmental groups.

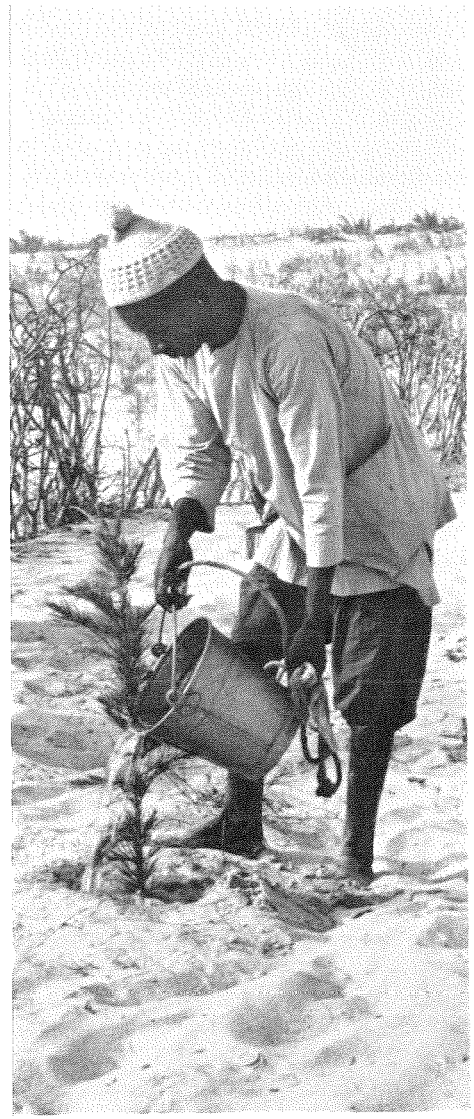
In Asia, USAID is assisting the Haribon Foundation, a leading conservation group in the Philippines, to develop a biological diversity conservation plan for the nation.

This effort is particularly timely because the depletion of biological diversity in the Philippines—a nation of over 7,100 islands with diverse and highly endemic wildlife—is accelerating. Today, for example, some 50% of the nation's four million hectares of coral reefs are either dying or have been destroyed due to soil degradation resulting from deforestation and other human activities, including tourism and commercial exploitation.

In Honduras, USAID helped the Honduran Ecological Association (AHE) to grow into the only private, non-profit group of its kind in the country. The association, formed in 1976 with 15 members, now has almost 400 members and many local volunteers. AHE mounts multimedia public education campaigns and operates an information resources center.

Ecuador's *Fundacion Natura*'s public education programs are a model for many other nations in design, execution and impact. Established by a group of concerned Ecuadorean citizens in 1978, it has, with USAID support, become one of the most rapidly growing private environmental groups in Latin America.

"*Fundacion Natura*'s first order of business was the development of an environmental profile for Ecuador," says Jim Hester. "It provided an analytical framework for better understanding and prioritizing environmental issues and the basis for a variety of programs to respond to the environmental needs of the nation."



USAID works closely with both U.S. environmental groups and indigenous organizations in developing countries to strengthen the foundation for sustainable environmental programs.

A glossy, popular version of the profile was issued and distributed to leaders of business and industry. After surveying the national institutions dealing with natural resources, *Fundacion Natura* devised a strategy to support environmental conservation aimed at all sectors of Ecuadorean society—from government leaders to elementary school children.

Articles on specific environmental issues were placed in institutional publications—tailored to suit the style and format of each individual agency. A series of wall posters on a

wide array of subjects from noise pollution to national parks has been printed and placed in over 450 public institutions and elementary and high schools. Environmental seminars for community leaders and journalists are conducted. Short radio programs on Ecuador's natural heritage used creative approaches to tell the story.

One program, for example, featured a man driving around the Ecuadorean countryside explaining the natural world. Another used Halley's Comet as a vehicle to present changes that have occurred in the Earth's environment between the comet's appearances. A number of television films were broadcast in several areas of the country and later "recycled" and used as "shorts" in Ecuadorean movie theaters.

"Their content is intentionally emotional, but the message that the films drive home is that while Ecuador has severe environmental problems, they are not irreversible if people begin to act now," says Hester. *Fundacion Natura* also publishes a monthly newsletter, environmental comics for children and books on the endangered species of Ecuador and birds of the Quito Valley. A teacher's manual was prepared for grades one through six, integrating environment into the country's science curriculum.

Because sound planning and management rely on comprehensive and accurate natural resource data often lacking in many developing nations, USAID is building systems to meet this vital information need. USAID's support for the Nature Conservancy's network of conservation data centers in Latin America and the Caribbean is an example. The conservancy, a private U.S.-based conservation organization, established such centers in Colombia, Costa Rica, the Netherlands Antilles and Puerto Rico as part of its strategy to build a country-by-country network in the Western Hemisphere. USAID is helping expand data center programs in Bolivia, Ecuador, Guatemala, Panama and Paraguay.

In Bolivia, for example, a data center opened last year in La Paz. A link already has been established with the Beni Biological Station and administrative headquarters of the 330,000-acre Beni Biological Reserve.

Panama Strives to Protect Environment

Institution building is central for sound natural resource management. To build a strong base for environmental awareness and action in the developing world, USAID supports private organizations such as Fundacion PA.NA.M.A. The foundation's president, Felix Nunez, explains the organization's program.

Panama may be better known for its canal linking two oceans, but it also is a nation of rich and varied natural vegetation and a diverse fauna that includes species from North and South America. Its coasts are famous for their beauty and abundant marine life.

Like many tropical countries, Panama has not escaped the ravages of uncontrolled exploitation of natural resources and the environment.

Recognizing the need for increased private sector involvement in the management and protection of natural resources and the environment, a number of Panamanian conservation groups formed the Foundation for National Parks and the Environment *(Fundacion PA.NA.M.A.)* in January 1983.

Their main objective was to build a strong organization through the private sector that could actively and effectively participate in the decision making, planning and management of Panama's natural resources and environment. *Fundacion PA.NA.M.A.* became the private sector's legal entity to coordinate and consolidate conservation efforts.

In June 1984, the group received a $1 million operational grant from USAID, through the World Wildlife Fund-US, to strengthen its administrative and managerial capacity.

In addition to training efforts, the foundation focuses on resource management, education and research. More than 40 field projects are conducted by member groups throughout the country. The majority are in support of Panama's national park and protected areas system (park interpretation, environmental education, infrastructure development, public awareness and tourism promotion). More specialized projects are oriented to research on fauna, flora, agroforestry and mariculture.

The foundation also provides consultation services on national and regional environmental problems to universities and environmental organizations.

Recently, *Fundacion PA.NA.M.A.* was invited to participate in RENARE's National Plan for the Protection of Wildland and Natural Renewable Resources, an extensive effort to curb the rate of degradation of forested areas and the uncontrolled exploitation of wildlife.

The foundation cooperates with LIDEMA, the newly formed Bolivian environmental league, and shares its experience in building a base for conservation in the private sector with CONAF, Chile's Department of Wildlife.

Fundacion PA.NA.M.A.'s record is one of strong enthusiasm, dedication and great concern for the future of Panama's natural resources.

Assessing National Conservation Strategies

Because the need for accurate natural resource information in developing nations is critical, USAID pioneered the environmental profile. The profile assesses a nation's natural resource base, its environmental laws and institutions and recommends environmental action.

Some 23 profiles have been completed since 1979. Not only have the profiles become a model for other donor agencies, but they also have stimulated a broad range of environmental activities.

In Costa Rica, for example, the profile was used to develop environmental education materials, including texts for primary and secondary schools as well as universities.

The Honduras profile was the impetus for an extensive natural resource management project instrumental in halting soil erosion in the Choluteca watershed area and was the basis for the environmental education programs of the Honduran Ecological Association.

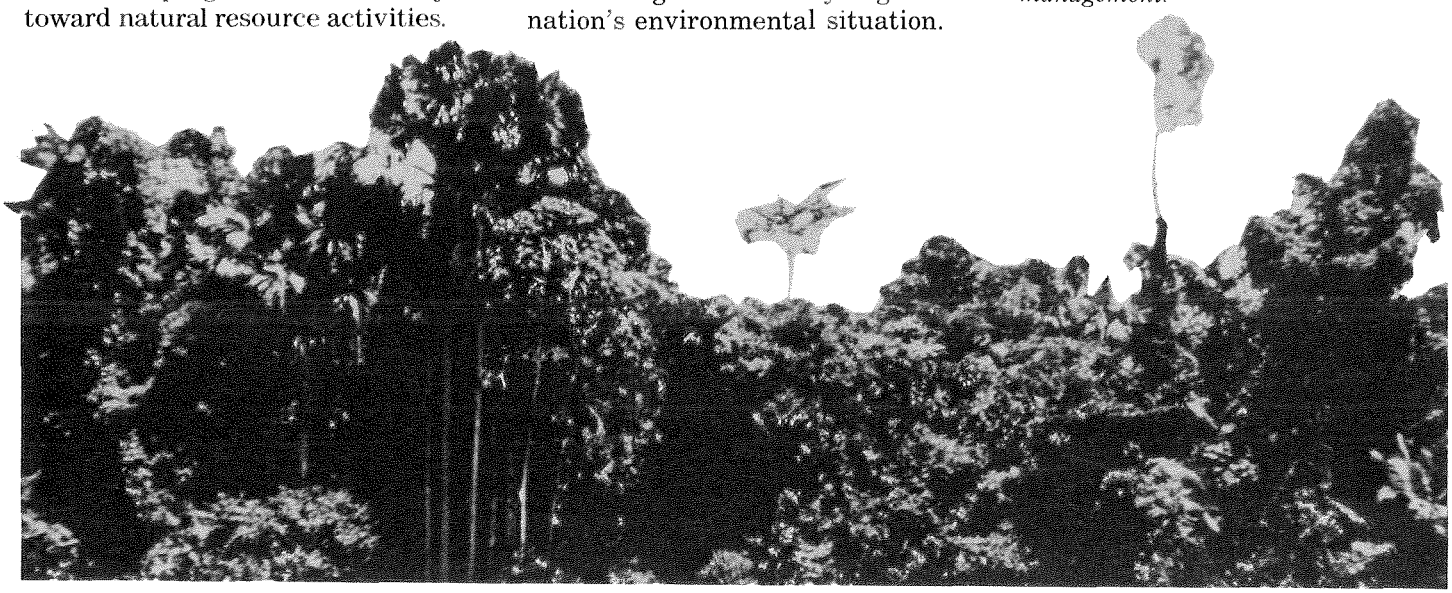
In the Dominican Republic, the profile helped orient a large part of the USAID program in the country toward natural resource activities.

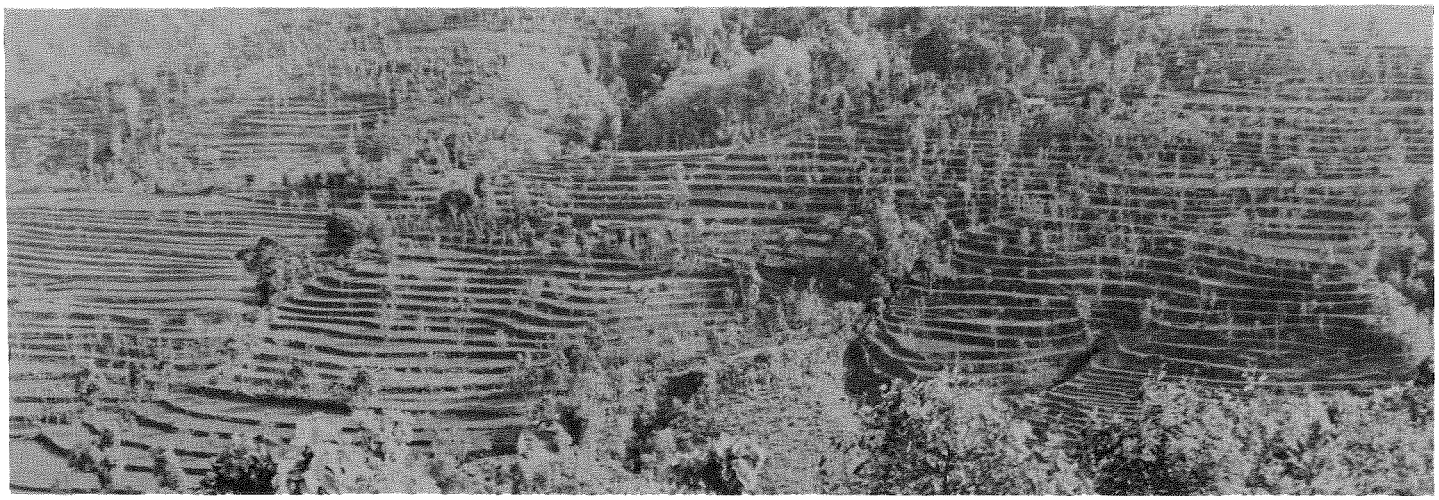
In Belize, the Belize Audubon Society is marketing copies of the environmental profile to support its conservation activities. Though the profile was published only three years ago, because of its recommendations, plans are under way to establish a marine reserve on the country's barrier reef—the second largest in the world.

To supplement the information contained in country-specific profiles, USAID supported the International Institute for Environment and Development in compiling a regional profile for Central America—the first effort ever to integrate individual profile data into a regional analysis. It identifies the mutual environmental issues shared by the Central American nations and is expected to open avenues for joint activities.

"We make every effort to involve experts of a particular country in the profiling process," notes Molly Kux, environmental coordinator in the Bureau for Science and Technology. In Thailand, for example, the Thai Development Research Institute took the leading role in analyzing the nation's environmental situation.

Environmental profiles can be instrumental in halting natural resource degradation such as soil erosion and in promoting forest management.





In Nepal the development of a national conservation strategy represents the first major environmental data-gathering and analysis effort in the country.

The resulting profile was recently used in the Sixth National Economic and Social Development Plan (1987-1991)—the first time this type of information has been used in national planning.

"To follow up the environmental profile, the USAID mission in Thailand is cooperating with the government to plan an environment and natural resources policy and management project in Thailand," adds Mission Director John Eriksson. "This project will address the broad range of environmental issues and institutions in the country at all levels, including sustainable agriculture, industrial pollution, solid waste management, forestry, coastal zone management, biological diversity, environmental assessment, training and the development of private voluntary organizations."

The development of national conservation strategies is closely related to the environmental profiling effort. USAID works closely with organizations, such as the International Union for Conservation of Nature and Natural Resources (IUCN), the International Institute for Environment and Development (IIED) and the Canadian International Development Agency (CIDA), in developing national conservation strategies.

"These conceptually follow the World Conservation Strategy developed by IUCN in coordination with the World Wildlife Fund and the U.N. Environment Program in 1980," says Kux. Presently, national strategies are under way in Nepal and Sri Lanka.

In Nepal, for example, the national strategy is the first major environmental data-gathering and analysis effort in the country. When completed later this year, it will examine the present resource situation in Nepal and present a conservation action plan.

"The preparation of the strategy involved Nepalese experts from the private agencies as well as government organizations," Kux stresses. Village, district and regional meetings were held in most areas of the country bringing together villages, tenant farmers, landowners, industrialists, farmer and women's organizations and youth clubs in the process. "This type of broad-based involvement is necessary if the strategy is to realistically and comprehensively address the nation's needs," she adds.

"The need to protect the environment and to preserve the planet's natural resource base is a vital part of USAID's agenda," stresses Norman Cohen. "The Agency not only stands by the environmental integrity of its own programs, but also encourages other donors and nations to adopt responsible policies to promote sustained development."

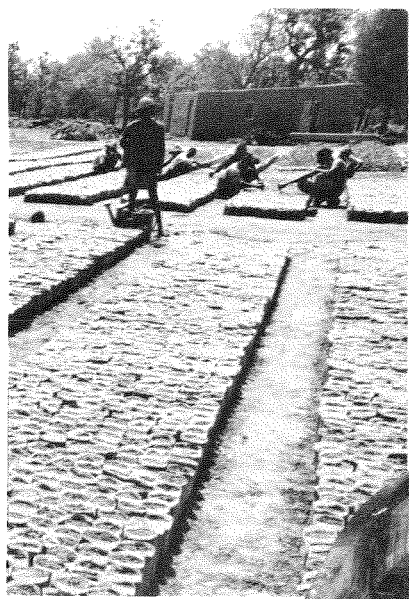
Promoting Environmental Law

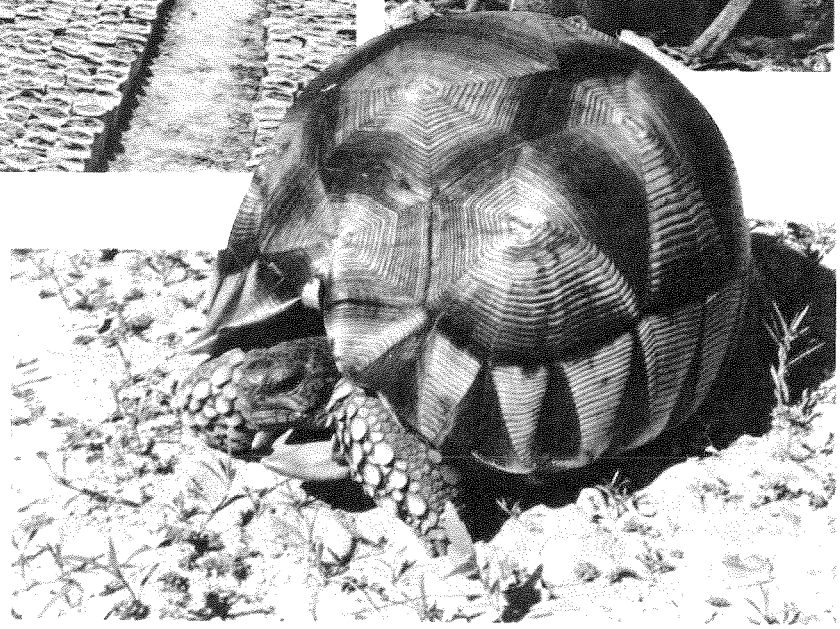
Environmental laws and their enforcement help ensure that sound environmental practices are woven into national life.

USAID supports the development of national environmental legislation. For example, assistance in forming environmental laws was provided to the Environmental Problems Foundation of Turkey and to Ecuador's *Fundacion Natura.*

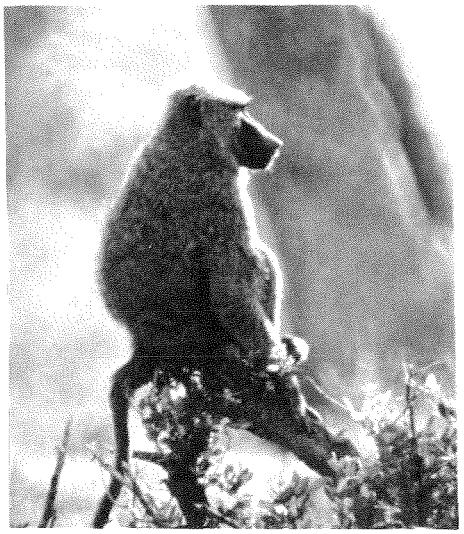
Assistance also was provided to integrate environment and natural resource issues into the curriculum of the International Development Law Institute in Rome and to the Bolivian Vice Presidential Commission for the Environment in drafting legislation.

As a result, a number of new concepts were incorporated into the draft of Bolivia's environmental law, including establishing a national environmental policy, creating a system of enforcement and forming a special environmental fund that would provide money from the general treasury to correct certain types of environmental damage.



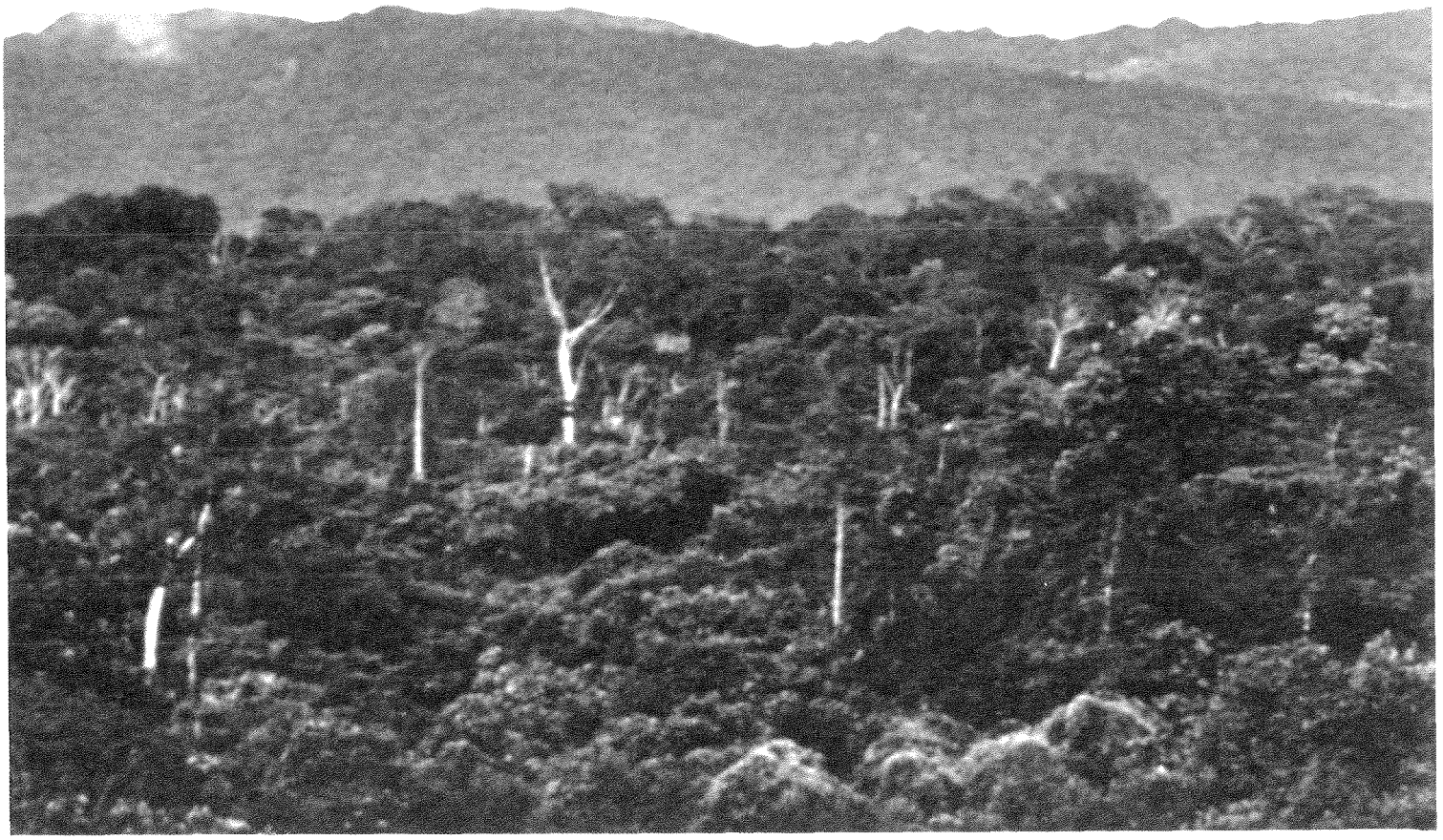


Biological Diversity:
An Endowment for Future Survival



Tropical forests—where almost two-thirds of the world's plant and animal species are found—are gold mines for science, industry and agriculture. Yet, in many areas less than 1% of existing tropical plants have been intensively studied for their potentially useful properties, and time is running out.

At the present rate of tropical forest destruction, scientists estimate that more than 11 million acres are cleared annually for farming, ranching, fuelwood, lumber production and other activities as population pressures grow and the need for fuel, lumber and agricultural land increases. At current rates of deforestation, more than two million species could become extinct, and virtually all accessible primary tropical moist forest may disappear within the next 50 years.



"Developing nations face a major challenge in protecting biological diversity."

Because most tropical forests are found in developing countries, these nations face a major challenge in dealing with the need to protect biological diversity. Yet, it is sometimes difficult to look at long-term needs when confronted with pressing and immediate questions such as obtaining food, fuel and currency; buying essential products; and paying mounting debts.

"We are fully committed to the conservation of biological diversity for the long term," says Nyle Brady, senior assistant administrator for the Bureau for Science and Technology at the U.S. Agency for International Development (USAID). "The Earth's diversity of plants and animals and the genetic heritage they represent are humanity's endowment for future survival."

Though programs aimed at sustainable development have long been a concern of USAID, the Agency recently has taken a number of steps aimed specifically at the protection of biological diversity.

With the assistance of the National Academy of Sciences, USAID initiated the establishment of a Consultative Group on Biological Diversity to share information and identify priority concerns and programs in developing countries that need donor support.

A collaborative USAID-Peace Corps initiative on biological diversity will strengthen Peace Corps programming capabilities for the conservation of biological diversity and better

define conservation priorities in volunteer assignments. Present numbers of volunteers serving in protected area management, species inventory work and wildlife management will be expanded, and recruitment and training of volunteers will be strengthened in priority countries.

"A working group was set up to coordinate and develop a set of activities to protect biological diversity following a Congressional earmarking of funds for this purpose in 1986," says Jack Vanderryn, Agency director for energy and natural resources in the Bureau for Science and Technology.

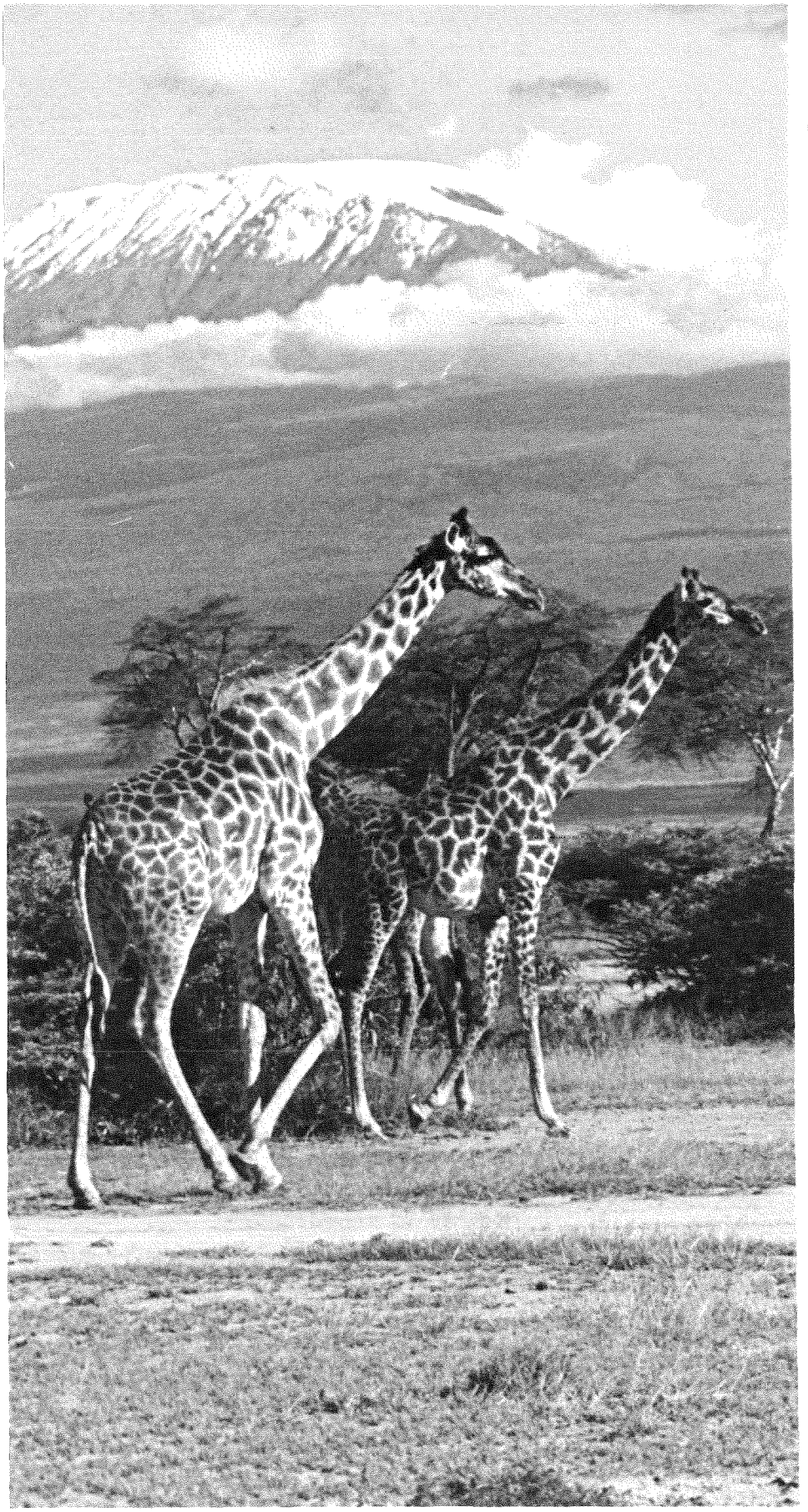
Most of the activities selected for funding have matching funds either raised or provided by collaborating agencies, such as the World Wildlife Fund-US, the Nature Conservancy, the African Wildlife Foundation, the International Union for the Conservation of Nature and Natural Resources, the U.S. Fish and Wildlife Service and the U.S. National Park Service, which more than doubled the $2.3 million provided by USAID this year.

The initiatives to preserve biological diversity will be carried out throughout the developing world.

Africa

"Madagascar is among the highest priority countries for conservation in the world," says Ed Toth, natural resources advisor in the Africa Bureau. The island nation off the coast of Mozambique not only has a high level of species diversity, but a large number of these species are found nowhere else. Much of the flora and fauna are endangered.

"USAID will support the World Wildlife Fund-US to carry out an inventory of the flora and fauna of southern Madagascar as well as work directly with communities surrounding an important natural area to increase their agricultural productivity while decreasing pressure on protected areas," Toth notes. The project will take place in and adjacent to the Beza Mahafaly Reserve, which contains many rare



In some parts of Africa only a few giraffes survive. USAID is showing governments how to maintain preserves and profit from tourism.

USAID is working to preserve flora and fauna throughout the world.

and unique plants and four species of lemurs. A training program for Malagasy counterparts in natural resource management also will be expanded.

Working with the African Wildlife Foundation, USAID will establish a conservation education and extension program linking conservation with rural development as part of the curriculum at Mweka College of African Wildlife Management, an internationally-known regional institution in Tanzania. A number of Mweka's graduates have gone on to hold senior natural resource management positions in their respective governments. The directors of wildlife in Kenya, Zambia, Malawi and Tanzania, for example, are Mweka graduates.

"We helped fund Mweka when it was established in 1963 and again in the late 1970s," Toth says. "It is a logical move for us to upgrade and expand the conservation program there now."

USAID also will support the International Union for the Conservation of Nature and Natural Resources (IUCN) and the World Wildlife Fund program to address both development and conservation issues through comprehensive community-based resource management projects in the Inner Niger Delta in Mali. The delta is a wetland of global importance under the Ramsar Convention on Wetlands of International Significance, which the United States ratified in 1986. Activities will link forest and fisheries management with wetland conservation.

In Kenya, the Agency will assist the World Wildlife Fund to manage existing rhinoceros sanctuaries and monitor rhino populations and trends in their habitat status.

To help curb poaching of the endangered black rhino in Zimbabwe, support is provided to the National Parks and Wildlife Unit to construct

As part of a Smithsonian project, partially funded by USAID, Eric Dinerstein (center) monitors the endangered one-horned rhino in Chitwan National Park in Nepal.

housing and purchase transportation equipment for rangers.

USAID also is helping conduct an inventory of endangered plant species in several forest areas of Burundi in conjunction with the Peace Corps, and an environmental assessment of the impact of land and water resources development on wildlife, fisheries, forests and savannah resources is being completed in Somalia.

Asia and the Near East

Efforts under way in Asia and the Near East will help protect endangered species and strengthen the foundation for conservation planning and management.

"The Agency is assisting the Smithsonian Institution's collaborative effort to protect two endangered species in Nepal—the greater one-horned rhino and the wild Asiatic buffalo," says Stephen Lintner, environmental coordinator in the Asia and Near East Bureau.

The one-horned rhino in Chitwan National Park has been a victim of habitat destruction. Most of the gallery forests of the terai at the foothills of the Himalayas have been cut, and the tall riverine grasslands in Chitwan continue to be used by local villagers for fuelwood, fodder and thatching. As a result, the rhino population has dwindled.

"Our program will help with rhino population research and monitoring," Lintner explains, "and will also promote alternative fuels and fuelwood plantings among local villagers to decrease the need for using park resources as a primary source of fuel. The reforestation effort should relieve pressure on the natural forest, and the project should also have an impact on the long-term management of the park grasslands."

The wild Asiatic water buffalo, which is a highly endangered species in India and Nepal, provides an important gene pool for domestic species.

"We will support an effort by the Smithsonian to conduct research that will help understand the habits

The wild Asiatic water buffalo, which is a highly endangered species in India and Nepal, provides an important gene pool for domestic species.

and population dynamics of this water buffalo that will lead to better management,'' Lintner says.

In 1976, the last and only census of wild buffalos was conducted in Nepal's Kosi Tappu Wildlife Reserve. No formal research has been conducted on the species since then.

''There has been an increase in the park-versus-people conflict of the reserve area,'' Lintner explains. Farmers resent the wild animal population when large mammals from the reserve cross into fields and destroy crops. ''But, as yet, there is no assessment of the economic benefits the local people derive from the reserve resources,'' he adds. ''USAID support for this project will help generate management alternatives for the reserve area.

''We will also help develop a biological diversity survey and conservation action plan for the Philippines,'' he adds. The project, conducted in coordination with the International Institute for Environment and Development and the Haribon Foundation, a leading conservation group in the Philippines, will compile existing information on the status of parks and protected areas and the flora and fauna of that nation. ''The information from the comprehensive survey will be used to develop priorities for an effective conservation strategy for the country,'' says Lintner.

Working with the World Wildlife Fund, USAID also will support sea turtle conservation and public awareness programs in Thailand. The Agency is working in Yemen to develop alternatives to the use of rhinoceros horns for dagger handles—the single largest cause of rhino depletion. In Burma, USAID joins World Wildlife Fund and the U.S. National Park Service to assist the Burmese government with training to establish a national park system and a wildlife management program.

A plan for conserving biological diversity in the Near East and arid South Asia was developed in 1985 by USAID's Asia and Near East Bureau in cooperation with the Department of the Interior's Fish and Wildlife Service. A number of conservation projects resulted, including:

- The Environmental Problems Foundation of Turkey conducted a survey on biological diversity issues in Turkey and published its findings in Turkish and English;
- The College of Environmental Science and Forestry of the State University of New York at Syracuse, working with Indian organizations, produced educational programs for use in classrooms and on television in India;
- The Royal Society for the Conservation of Nature in Jordan constructed a Visitor Information Center at the Shaumari Reserve, a Ramsar treaty-designated wetland, to inform the general public and visiting school groups about the

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unique flora and fauna of the area; and,

- The government of Oman updated its sea turtle management plan.

Support also is provided to the Wildlife Institute of India in Dehra Dun, which was founded in 1982 to improve the conservation and management of the country's diverse heritage of wild fauna and flora, and efforts are under way to develop a national system of nature conservation clubs in Pakistan.

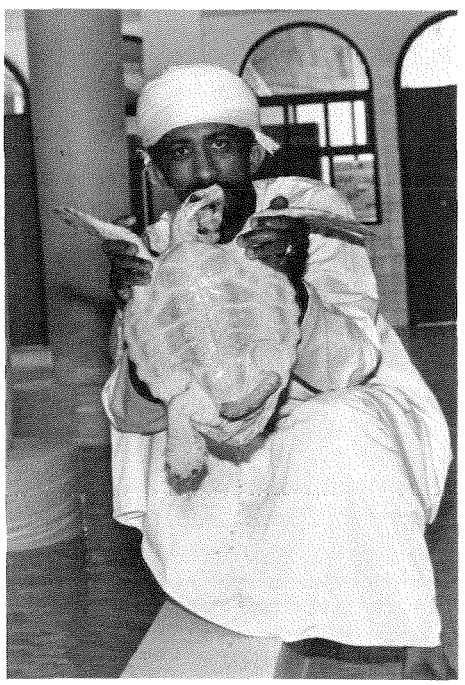
Other activities under the U.S. Fish and Wildlife Service Biological Diversity Grants program include bird and turtle surveys in the Philippines, an Indo-Malaysian wetlands survey, a training program for Southeast Asia country participants in parks and preserves management with the Israeli Society for the Protection of Nature and a turtle survey with the Center for Coastal Studies in Sri Lanka.

Latin America and the Caribbean

A number of activities in this region have direct bearing on the protection of biological diversity.

The Florida State Museum, for example, recently has produced a parks inventory and a national parks management or "stewardship" program for Haiti—a nation seriously affected by deforestation.

The USAID-supported project covered the Parc National de la Visite and the Park National Pic Macaya—both 2,000 hectares in size and reservoirs for numerous endemic species. Pic Macaya also harbors



Sea turtle management is just one form of research at the USAID-financed Marine Science and Fisheries Center in Oman.

the watersheds of the four most important Haitian rivers.

The stewardship plan proposes establishing an independent parks management authority in Haiti and designating the two parks as biosphere reserves with core-protected areas surrounded by zones of cooperation in which activities such as forestry, farming or tourism can take place. The plan also outlines specific conservation, research, education and training programs.

"A project that will begin managing the Pic Macaya National Park is currently under way," says Jim Hester, chief environmental officer in the Bureau for Latin America and the Caribbean

Also in Haiti, USAID will help the World Wildlife Fund and the Haiti Department of Tourism to establish and manage a national marine park in des Arcadins Archipelago. "The park has high tourist potential, and its establishment could help replenish the overexploited local fishing industry," he notes.

"In Costa Rica, we are supporting the management of the Corcovado National Park, a major priority for the government of Costa Rica, through methods that will enable scientific research, tourism and sustained use of resources to take place," adds Hester.

The Corcovado is unusual not only for the number of endangered species that live within it, but also because gold was found there and the park subsequently was invaded by gold miners. The Costa Rican government responded to what quickly became a severe problem and was successful in relocating the miners outside park boundaries.

In Panama, USAID support is helping set up a forest park preserve on the border of a Kuna Indian reservation. The preserve will help deter non-Kuna squatters who, because of population pressure in other areas of Panama, would otherwise occupy and farm the land, which now will provide a natural wildlife habitat for scientific research. When

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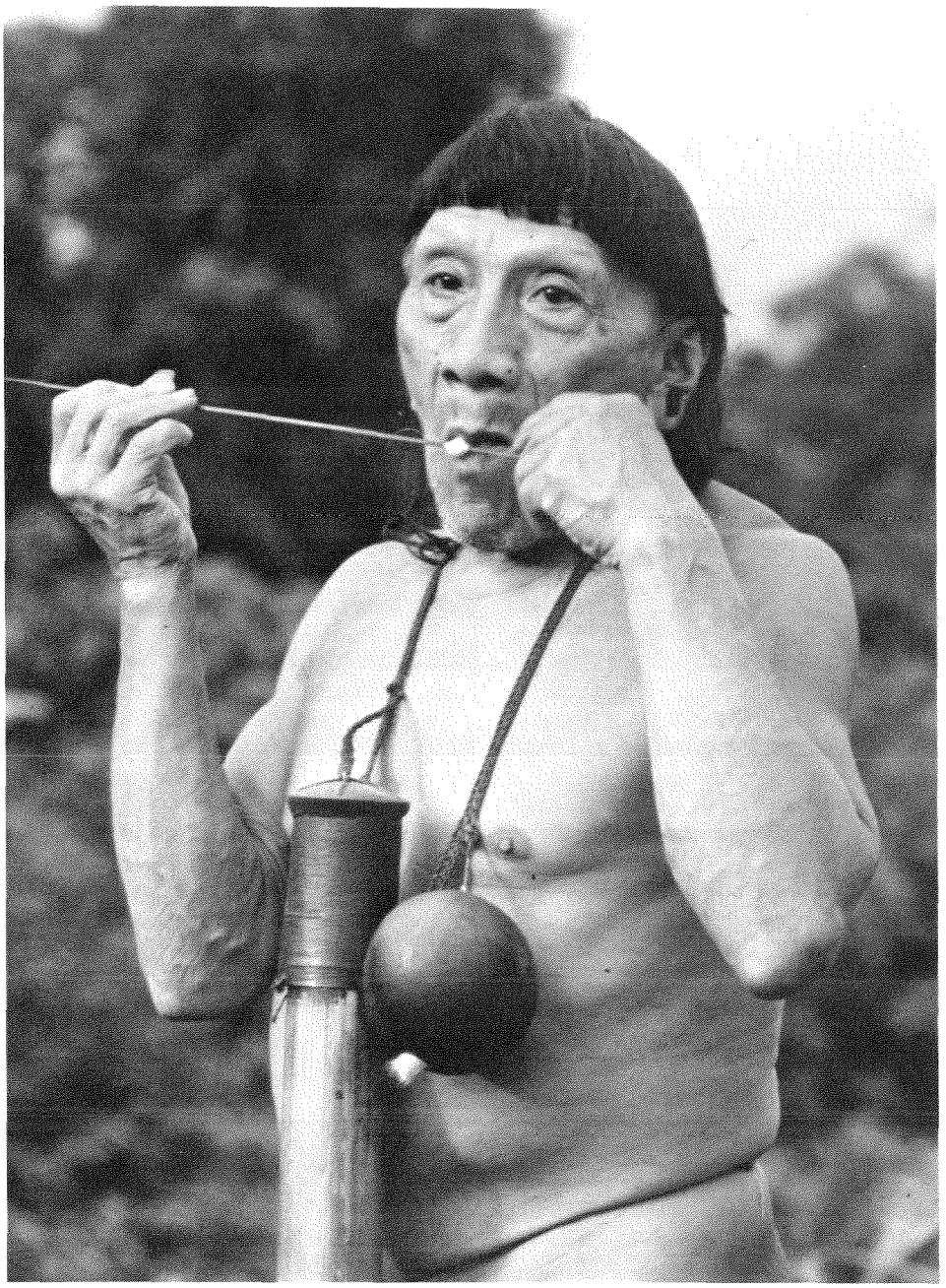


More than 300 species of medicinal plants used by Quechua and Shuar Indians of Peru have been collected, including some for treatment of diarrhea, fever, intestinal parasites and snake bites.

completed, the 20-square kilometer reserve will include nature trails, observation sites and research substations and will be administered by the Kuna Indians themselves. Except for nature trails, the reserve will be left in its virgin state.

In Peru, USAID is working with the Nature Conservancy and two Peruvian non-government organizations to support the development and implementation of a management plan for the Yanachaja/Chermillen National Park. Proper park management would conserve endangered species, contribute to maintenance of nearby fragile ecosystems and provide a source of tourist revenue.

"To translate preservation into practice, both decision makers and people using wildlife resources in the course of their daily lives must be made aware of the economic value of plant and animal species," says Hester.

For this reason, the Agency is identifying ways for developing countries to derive economic benefits from tropical forests. "We are studying the value of keeping the jungle as a jungle. If this is not done and the value is not appreciated, forests will continue to be cut down for timber or grazing land," notes Hester. "We are looking at tropical species for medicinal, food and commercial value as well as for reforestation."

A collaborative effort to conduct dendrological and economic botany studies in the forests of the Amazon region of eastern Ecuador by the New York and Missouri botanical gardens and counterpart Ecuadorean institutions has been effective in this regard. The two-year, USAID-supported program initiated in 1984 assessed the economic importance of jungle species and the possibilities of

using these resources to benefit local populations.

"The flora of the region is extremely rich biologically, but it is being rapidly converted from forest to agricultural use," says Michael Balick, assistant director of the New York Botanical Garden's Institute for Economic Botany. Ecuador, a nation where 42% of the population depends on agriculture for its livelihood, has lost 10% of its tropical forest cover in the last 10 years.

"Our first priority in trying to use the resource is to know what's there," says Marshall Crosby, director of botanical information at the Missouri Botanical Garden. The dendrological study has collected about 5,000 Amazonian trees, with an estimated 70% representing species not recorded previously in this biologically rich area. A guide to tree identification of northeastern Ecuador will be produced.

Both the New York and Missouri botanical gardens have helped provide three herbaria in Ecuador with specimens of native flora and provided technical and managerial training to herbaria staff to build local expertise in botanical research.

An economic botany project has enabled scientists from the New York Botanical Garden's Institute of Economic Botany to identify plant sources of medicine, fine woods, fuel, fiber, food and food additives. For example, more than 300 species of medicinal plants used by Quechua and Shuar Indians have been collected, including some for treatment of diarrhea, fever, intestinal parasites and snake and spider bites.

"Indigenous societies have selected many plants from their rain forest environment for a myriad of uses through centuries of trial-and-error testing," says Balick. "The Indian shaman or medicine man has a wealth of curative plants at his disposal, and we are tapping into this resource in our quest for biodynamic plants."

Some of the more important plants have been sent to U.S. laboratories to be analyzed for anti-tumor use and other applications. Students from the University of Illinois at Chicago College of Pharmacy also have joined in a number of collecting expeditions, selecting samples with promising medicinal value for chemical and pharmaceutical analysis.

The cocona is a rich source of nutrition and is highly adaptable to a variety of growing situations.

"We also are providing the National Cancer Institute with some of the data that we have gathered under the USAID project as part of an accelerated effort to screen the world's flora for its potential in anti-cancer research," says Balick.

Plants are chemical factories, he explains. Over evolutionary time, as plants in the wild are attacked by insects and diseases, they develop chemical and other defense mechanisms, and only the fittest survive. Their unique and diverse chemical composition makes them valuable for medical research.

Several little-known food plants also have been analyzed nutritionally. For example, the widespread regional distribution of aguaje palm *(Mauritia flexuosa)* has been documented. "This palm is rich in beta carotene and a major source of cash income elsewhere in Amazonia but is not commercially exploited as yet in Ecuador," Balick points out.

In Brazil and Peru, the oily fruit of this palm, locally called buriti, has been the source of an extremely valuable subsistence industry—producing sherbet flavorings, dried sweet paste and beverages. The palm also provides fiber and other construction materials for the commercial market. "It grows in swamps and has roots that permit gaseous exchange underwater, which enables it to grow in areas that could not support other types of trees," Balick adds.

A market inventory of native forest plant products was made to determine what native products could be commercially exploited both nationally and internationally. Estimates of the quantities and economic value of the products—timber, palm hearts, fruits and medicinal plants—were included.

The botanical work in Ecuador has attracted media attention. A documentary on the medicinal plants of the region was produced by the Canadian Broadcasting Corporation and syndicated through the Public Broadcasting System in the United States.

Jan Salick of the Institute of Economic Botany conducted ethnobotanical research among the Amuesha Indians of Peru's Central Selva Valley with USAID support.

"In conjunction with a USAID forestry project in the region, I looked at how to preserve the diversity of forest plants on which people

With USAID support, Jan Salick of the Institute of Economic Botany explores ways to preserve the diversity of forest plants on which people depend for subsistence.

depend for subsistence," she says. "My study incorporated several hundred species of indigenously used plants into forest management practices. This not only preserves the plants, but enables people to preserve their way of life, which is linked to their natural environment."

Salick also examined indigenous plant resources with economic potential. The peach tomato, or cocona, is an example.

"The cocona was described in botanical literature, but no study was conducted that looked at the plant as a potential crop. Yet, the cocona, which is highly adaptable to a variety of situations, is an ideal tropical crop to cultivate in the region because of the high rainfall and poor soil conditions there," she says. "It is a rich source of nutrition—high in iron, niacin and vitamins A and C—so often lacking in the diets of tropical jungle inhabitants, particularly women and children."

Incorporating the use of plants into forest management not only preserves the plants, but enables people to preserve their way of life.

In Peru, a complementary USAID-supported effort with the Missouri Botanical Garden has resulted in the identification of the *Tabebuia impetiginosa* tree, previously unknown in the Huallaga Valley. "It has achieved prominence as the source of a bark now being widely considered a potential cure for some cancers," says Alwyn Gentry, associate curator at the Missouri Botanical Garden.

Several scientific studies have shown that active properties of the bark are effective against some forms of cancer in laboratory rats and mice. Studies of bark chemistry are in progress at the University of Illinois in Chicago.

"The tree has the heaviest and thickest wood in the neotropics, and, thus, its commercial potential is also easy to appreciate," says Gentry. "Many populations of the species in Brazil have already been wiped out by bark hunters, and the cost of the

The U.S. government will continue to remain in the forefront of the effort to safeguard the world's natural heritage and enhance the quality of life for generations to come.

bark is rising rapidly. A commercial crop of this tree could be a boon to an ecologically devastated area like the Huallaga Valley."

Through USAID support, Missouri Botanical Garden scientists were able to determine that root extract from the *Martinella*, a Peruvian vine, is an effective treatment for conjunctivitis and related eye ailments. "It has exactly the same effect as Terramycin but takes slightly longer to effect a cure," Gentry says. The use of *Martinella* root extract for eye trouble is especially prevalent among the Amuesha and Campa Indians in the Palcazu and Pichia valleys.

Also in Peru, it was discovered that dried seeds of a little-known species in the Palcazu Valley burn with a clear blue flame and are used by the Campa Indians instead of candles.

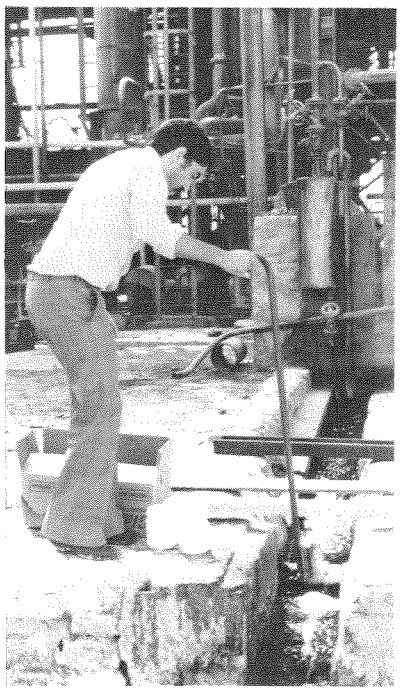
"We identified the plant as *Fevillea pedatifolia*, a liana of the Cucurbitaceae family," says Gentry. "The property of burning with a clear blue flame is very rare in seeds and indicates unusual richness in natural oils."

The seeds now are being investigated as potentially new alternative fuel sources that can replace costly kerosene. Gentry suggests that replacing the lianas in an otherwise intact forest with *Fevillea*, producing at normal levels, could give oil yields as high as in the most productive oil plant plantations—without cutting a single tree.

To further study economic valuation and incentives for preserving biological diversity, USAID is supporting an effort by the IUCN to analyze the role of economics in major biological diversity issues and to understand how government policies create incentives and disincentives for activities affecting biological diversity. This analysis will produce a guide on how these incentives and disincentives can be used to promote activities beneficial to preserving diversity.

"We are witnessing a convergence of interests that will be a powerful force in the future—a growing consensus between the conservation and development communities that maintenance of biological diversity and sound economic development are not only compatible but mutually interdependent," says Brady.

"The preservation of biological diversity is a global priority. USAID has played an important role in shaping the U.S. government response and will continue to remain in the forefront of the effort to safeguard the world's natural heritage and to enhance the quality of life for the generations that follow."



Environmental Health and Safety
Fundamental to Development

The impact of man's activity on the natural environment can be hazardous to human health. Unsafe water and inadequate sanitation, industrial pollution and the use of dangerous pesticides are among the issues USAID is addressing to make this a safer and healthier world for all.

Water and Sanitation

Clean water is a fundamental requirement for human health and survival. In the developing world, 80% of all sickness has been attributed to unsafe and inadequate water supply and sanitation.

A lack of access to safe water has been a major contributor to the poor health status of many families in developing countries.

Improving environmental health conditions and providing better access to reliable, convenient and safe sources of water in both rural and urban areas are Agency objectives. Major projects, for example, have been initiated in Egypt, Jordan and Oman in water and wastewater management, and emergency assistance was provided to restore water and wastewater services in Lebanon.

Control measures to reduce water- and sanitation-related diarrheal diseases such as cholera, dysentery, typhoid fever, hookworm, guinea worm and roundworm can be relatively simple. These include maintaining and improving water quantity and quality, improving sanitation and excreta disposal practices, protecting water sources from environmental contamination and avoiding contact with infectious organisms such as schistosomes in the water. Making water supplies available close at hand also conserves time and energy and reduces the long treks, normally the responsibility of women, for a family's daily water in many developing countries.

Since 1973, USAID has supported more than 700 water and sanitation projects. In 1980, the Water and Sanitation for Health (WASH) project was created to provide Agency managers with short-term, interdisciplinary technical assistance and information on water supply for rural and suburban settlements, sanitation and environmental health. The project has provided assistance in engineering, hygiene education, training, community participation, institutional development and financing to more than 50 nations.

As an example, U.S. assistance has made a difference in Malawi. Since 1981, the Malawi Self-Help Rural Water Project has resulted in the installation of 18 gravity-fed water systems involving over 2,000 kilometers of pipe and more than 2,600 public taps, providing potable water to over 265,000 people.

"The program is recognized as one of the most successful in Africa," says Dennis Warner, deputy director of the WASH project.

The USAID goal was to improve the basic living conditions and the health of Malawi's rural population by reducing water-related diseases. It achieved this objective by building on and expanding an already existing successful rural piped water program.

The first gravity-piped water scheme began in 1967 in Chingale, in the central region of Malawi. It was organized by the village leaders with the assistance of the Ministry of Community Development and the U.S. ambassador's self-help fund. The project emphasized community involvement and decision making in planning, organizing, managing and constructing the system. The project in Chingale was completed in 1969 and involved some 3,000 people and the installation of 25 kilometers of piping.

The project stimulated the development of other similar

activities. Village leaders from Mulange in the southern region of Malawi visited Chingale, talked to the people involved and saw what could be done. Through word of mouth, the message spread that water could be piped great distances down from the hills and that technical assistance was available from the government to build and maintain the systems.

"What was new in the Agency's approach was the integration of water supply with hygiene education and sanitation improvements to realize maximum health benefits," Warner continues. To date, an estimated 900 villages have been reached by hygiene education efforts, benefiting more than 270,000 people.

USAID also introduced health and sanitation issues into the project by setting up the Health Education and Sanitation Promotion (HESP) program in the Ministry of Health. This new component enabled field-level personnel to provide health assistance and health surveillance in rural areas and to promote improved latrines and other sanitation facilities.

Contributing to the success of the program in Malawi have been strong government policies for rural development and self-reliance as well as a favorable geographic setting with high forested plateau providing good water catchment areas and a source for relatively unpolluted water for the populated plains below.

In the Republic of Togo, USAID efforts also have had an impact. The government of Togo's Third National Development Plan (1976-80) identified the provision of potable water as its highest priority and called for assistance in developing an action program. USAID responded with the seven-year Rural Water and Environmental Sanitation Project, which began in 1980.

The project is designed to provide safe rural water to villages and to improve the health and living conditions of some 600,000 rural Togolese in 800 villages. It has to date resulted in the drilling of 1,050 wells.

Lack of access to safe water has been a major contributor to the poor health status of many Togolese, 80% of whom live in rural regions. The high incidence of water-borne diseases contributed to high mortality rates and decreases in labor productivity. Introducing a source of safe water in the countryside has helped reduce the incidence of diseases such as guinea worm.

Making water available close at hand reduces long treks for a family's daily water and conserves time and energy.

"After the first 400 wells were drilled, we selected those villages with a high incidence of guinea worm disease as the sites for additional well-drilling," notes Agma Prins, an international health consultant working on the project. "Our objective was to break the cycle of the disease."

There were other health benefits. Training was provided to 3,600 village women volunteers in oral rehydration therapy, a life-saving solution of salts, sugar and water known to be effective against dehydration resulting from diarrheal disease.

"These women are, in turn,

"The project shows that water supply activities can provide an organizational structure through which other health initiatives can take place."

responsible for training village mothers," notes Louis O'Brien, USAID's Togo-based technical assistant on the project. "We estimate that we have reached about 80,000 mothers in the country. The project shows that water supply activities can provide an organizational structure through which other health initiatives can take place."

The project also provided alternative water sources where well-drilling was not successful. "We have constructed 228 family cisterns this year and more than 450 latrine stalls," adds O'Brien.

"The water supply effort involves a major training element in organizing villagers to help solve problems," adds Paul Guild, USAID officer for Central and Coastal West Africa. "In this way, the program is also a catalyst to rural development." The emphasis is on forming and training village development committees and providing organizational skills as well as supplying and maintaining water pumps.

"These are vital skills that strengthen community participation in development and increase the ability of villages to improve the quality of life," says Guild.

"The project had significant effect on the establishment of the national water policy in Togo last year," Prins stresses. "All rural water programs in the country now must have organizational components to establish village pump committees and train village pump repair workers."

The project also provides a good example of close cooperation among donor agencies and a host government. Financing is provided by USAID, the French-supported *Fonds d'Aide et de Cooperation* (FAC), the European Common Market's *Fonds Europeen de Developpement* (FED), the Peace Corps and the Togolese government. The project will be featured in a documentary for U.S. public broadcasting.

Clean water is a fundamental requirement for human health and survival.

While USAID efforts in Malawi and Togo focus on rural water needs, urban water and sanitation programs also are important areas of concern for the Agency. Since 1978, USAID has been working in Egypt to support projects to rehabilitate and expand wastewater systems in Cairo, Alexandria and the canal cities of Ismailia, Port Said and Suez as well as in a large number of provincial cities.

In 1984, USAID committed $1.2 billion to improve water and wastewater services in Egypt. Support is provided in strategic planning of wastewater management as well as in the actual design and construction of facilities to meet the demand. USAID also is helping support institutional development and training of personnel in the water and wastewater field.

A significant percentage of Egypt's rapidly growing population both in rural and urban areas is not served by water or wastewater systems. Many of the existing systems are outmoded or have suffered from poor maintenance. Fast-growing primary and secondary urban areas often lack adequate facilities for the

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For example, in Cairo, a city of 10-12 million people, the wastewater system is estimated to serve seven million. It is overloaded and functioning beyond full capacity. The wastewater treatment plants are in poor condition and treat a mere fraction of the city's wastewater, discharging the rest to irrigation drainage canals without treatment.

USAID support for a major rehabilitation program that included repair of pumping stations and cleaning of existing sewers already has directly benefited one million residents of Cairo by reducing chronic sewage flooding of homes and streets. "We have succeeded in getting the sewage off the streets," says Tom Johnson, project development officer in the Agency's Bureau for Asia and Near East.

The Cairo wastewater project, which is funding the expansion of wastewater collection, treatment and disposal, is expected to expand service capabilities to meet the needs of about 3.5 million in the next decade. In Alexandria, more than three million residents will benefit from service improvement and expansion, and in other cities about five million will benefit.

"USAID is also supporting similar water and wastewater programs aimed at improving water quality and environmental health conditions in Jordan and Oman," notes Stephen Lintner, environmental coordinator in the Bureau for Asia and Near East. "Water supply and wastewater management are recognized by most Near Eastern nations as their highest priority in environmental protection, given the extremely high levels of urbanization and the limited water resources."

The Office of Housing in the Agency's Bureau for Private Enterprise also is supporting water supply and wastewater programs in Morocco and Tunisia through its loan guarantee program. The water and wastewater issues in Egypt are environmental and health problems to which human engineering skills are applied to find solutions.

Industrial Safety

Industrial accidents also are a hazard to human health. The Bhopal gas leak in India and the Mexico City fuel storage explosion showed the disastrous effect of such accidents.

As a result, USAID joined forces with U.S. corporations to respond to industrial pollution and worker safety issues. Lintner explains, "Through a pilot project begun in 1985 with the World Environment Center, experts from the U.S. private sector volunteer to work with petrochemical, chemical, paper and manufacturing facilities in developing nations to create systems for emergency prevention, planning and management."

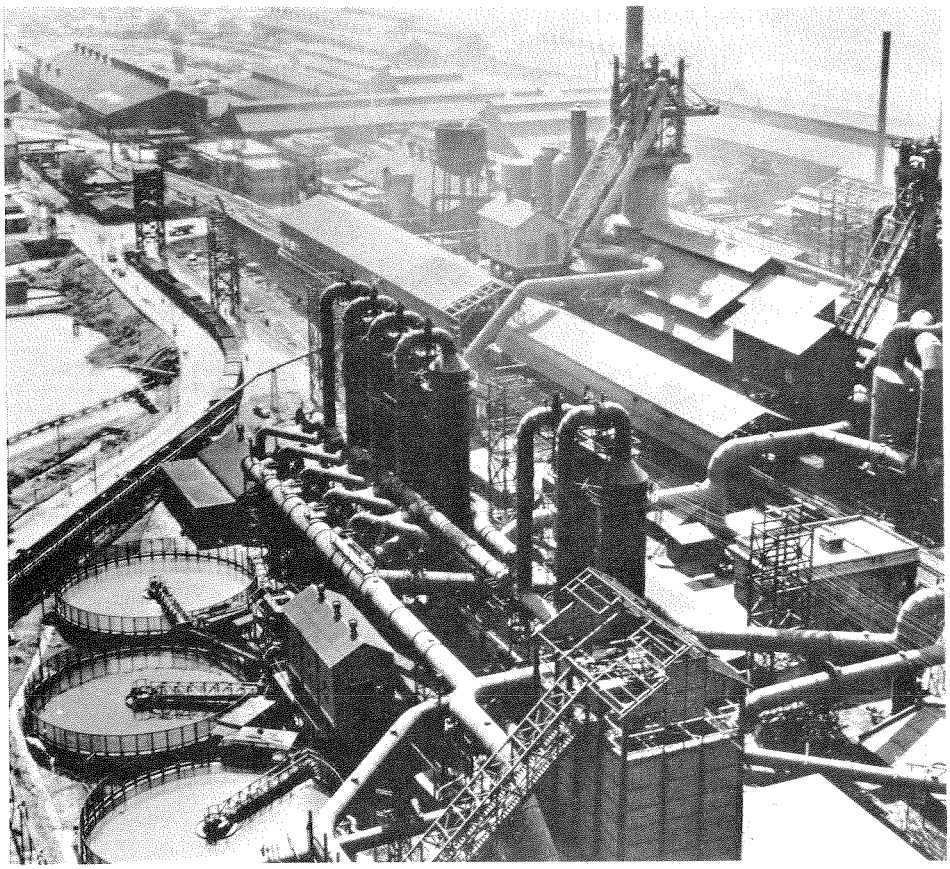
Whitman Bassow, president of the World Environment Center,

Fast-growing urban areas in Egypt often lack adequate facilities for the collection, treatment and disposal of wastewater, which poses a significant health hazard.

reports that last year, for example, U.S. specialists assisted companies in Jordan, Tunisia and Turkey in emergency management reviews and training.

"The need is enormous," Bassow says. "Many plants in developing countries do not have the technical resources or trained people to evaluate manufacturing processes in terms of environmental health and safety, environmental control and emergency response management. The service provided by the World Environment Center, USAID and American industry helps meet this important management need."

The project builds on an existing five-year USAID cooperative program with U.S. industry known as the International Environment and Development Service (IEDS) that began in 1983. IEDS sends industry volunteers to eligible countries to identify environmental problems at the plant level, recommend remedial action and provide training. More than 25 major American companies are participating.



Through a USAID-sponsored program, more than 25 American companies have sent volunteers to work with industries in developing nations. (Below) Farmers often do not have the knowledge needed to use pesticides safely.

Pesticides

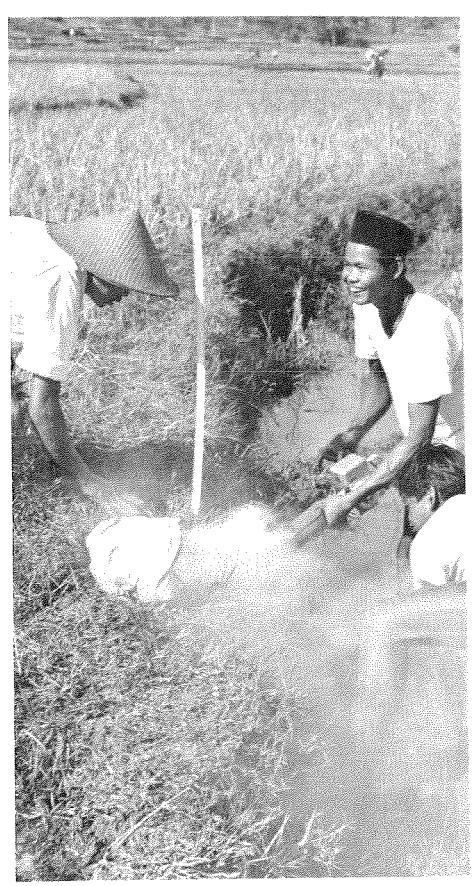
Rapidly expanding population growth increases pressure on the agricultural sector to produce more. This increased production often is achieved by control of pests on lands currently under cultivation.

"It is not surprising in this context that world pesticide sales grew from $8 billion in 1972 to almost $13 billion in 1983, with the most rapid growth occurring in developing countries," says Pat Koshel, energy and environmental policy advisor in the Bureau for Program and Policy Coordination.

As pesticide use increases, health and environmental effects must be monitored carefully. Alternative pest control strategies also need to be tested and applied more broadly.

"In developing countries, where there is less awareness of pesticide toxicity, farmers often do not have the knowledge or the technical skills needed to use pesticides properly," explains Koshel.

"Pesticides long banned in the United States and other developed countries are still available to farmers in developing countries. They are often inadequately labeled as to hazards, and labels may not be in the local language," adds Andrea Blumberg, an American Association for the Advancement of Science and Diplomacy Fellow in the Bureau for Science and Technology.



"Pesticides are often inappropriately repackaged at the local level, ultimately being sold in adulterated form. Because of inadequate labeling or instruction, they are frequently applied without the benefit of proper protective clothing. Also, farmers will often store pesticides and application equipment in a dwelling area, possibly with food and eating utensils."

"Some countries are making progress in enacting legislation to regulate pesticides, but there is still little capability for assessment of the most effective chemical for specific purposes or for safe and effective

application," explains Koshel.

USAID supports integrated pest management as a part of its agricultural program. This includes biological, cultural, physical and chemical behavioral controls and careful use of chemicals to reduce the use of toxic substances. The Agency operates under environmental procedures that require careful assessment of the use and handling of specific chemicals. These include economic, social and environmental risk-and-benefit analyses and strict adherence to detailed criteria in evaluating the potential impact of pesticide use.

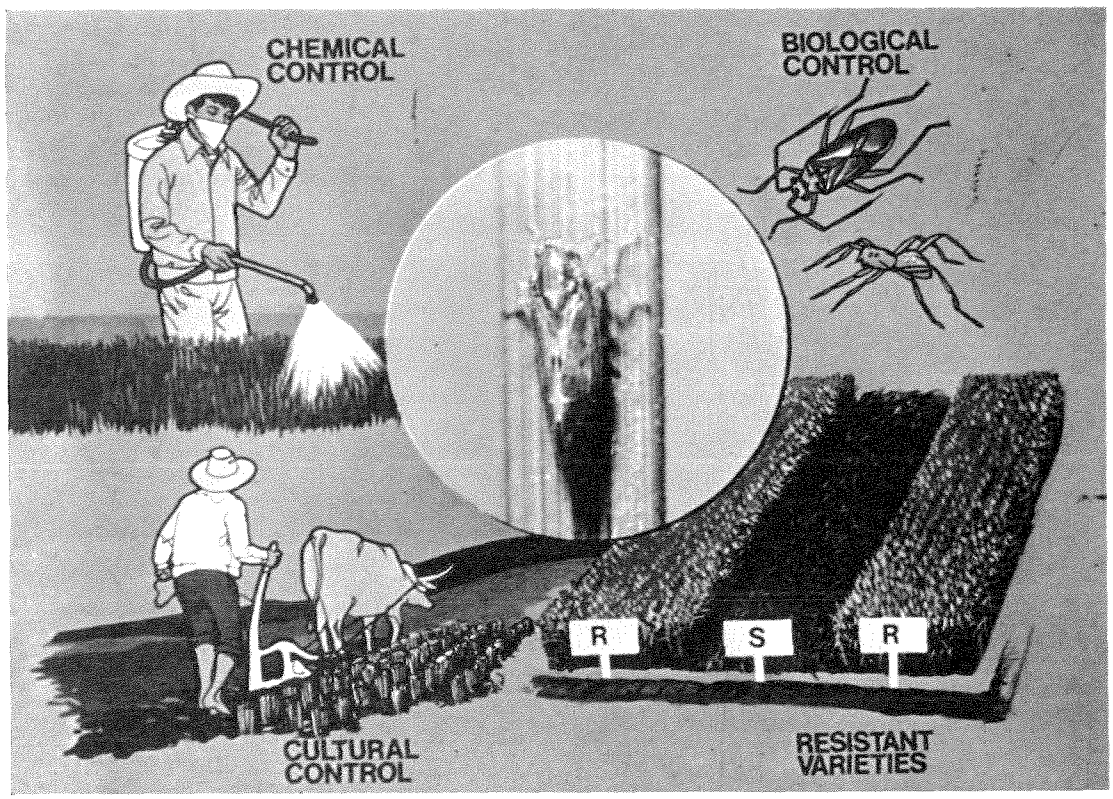
In 1976, USAID prepared a programmatic Environmental Impact Statement on the use of pesticides overseas that resulted in a major policy initiative issued in May 1978. The directive outlined Agency policy:

- To establish programs aimed at helping developing countries design and operate environmentally sound, integrated pest management systems and procedures in which pesticides are used only when necessary;
- To help build infrastructures for pest and pesticide management in developing countries;
- To exert international leadership by communicating U.S. policies and experience on pest control and pesticide problems to other nations and international organizations;
- To discourage requests for pesticides unless they are to be used in economically and environmentally sound, integrated pest management systems; and,
- To promote the use of available supplementary methods of vector control as well as to develop new and improved supplementary or alternative methods that do not depend on the use of persistent pesticides, including such methods as source reduction, water management, larviciding and biological control.

"While USAID continues to actively support the 1978 policy statement and ensures its enforcement through the rigorous application of the Agency's environmental procedures, we are in the process of writing better guidelines with a renewed emphasis on integrated pest management," says Norman Cohen, USAID's environmental coordinator. "We are forming a group of outside experts on environment and health that will help us review ongoing programs and provide suggestions for new and improved approaches that the Agency might adopt."

The World Bank recently has joined USAID to educate people in the developing world in the safe use of pesticides. USAID assisted the bank in developing pesticide guidelines that were announced in 1985. Although the focus of the guidelines is the safe and judicious use of pesticides, the document also promotes integrated pest management as an objective in agricultural development.

A number of Agency programs strengthen the indigenous capacities of developing nations in pesticide management. For example, a $6 million grant was authorized in 1984 for the five-year Integrated Pest Management project at the Center for Research and Training in Tropical Agriculture (CATIE) in Costa Rica. The project is reinforcing national and regional capabilities in Central America and Panama for integrated pest management through research, training and technical cooperation.



USAID supports integrated pest management as a part of its agricultural program, including biological, cultural, physical and chemical controls and careful use of toxic substances.

A 1985 contract with the Consortium for International Crop Protection (CICP), composed of 13 U.S. universities and the U.S. Department of Agriculture, also expands the capabilities of developing nations in pest and pesticide management.

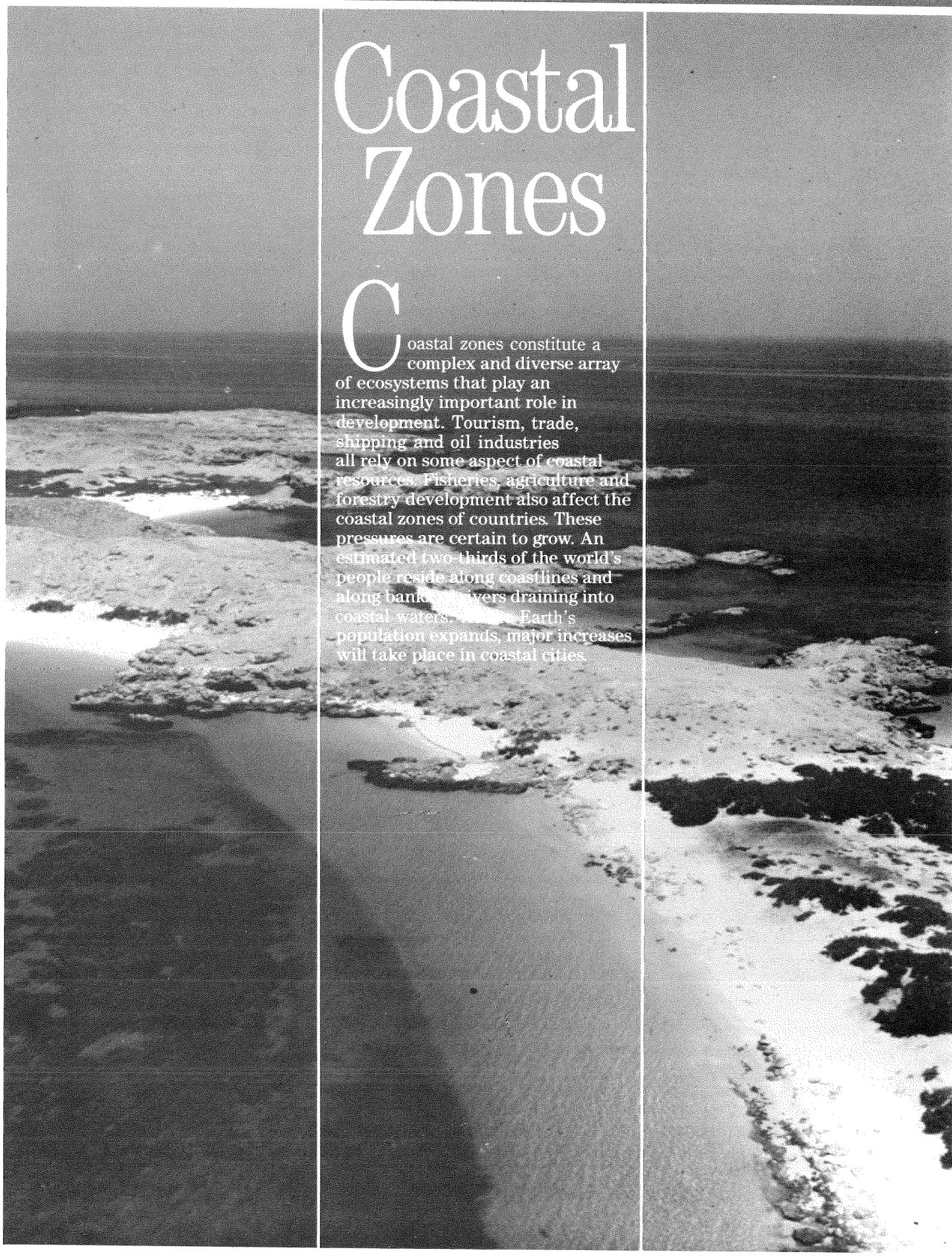
"The project was designed to assist farmers in developing countries to consider more agronomically, environmentally and economically sound crop protection," says CICP Executive Director Al Steinauer, who is based at the University of Maryland.

The consortium has been involved in training activities for integrated pest management in Mexico, Peru, Trinidad, Guatemala, Liberia, Honduras, Thailand, Grenada, Burundi and Tonga. These activities were often a collaborative effort with other donor agencies, such as the U.N. Food and Agriculture Organization, the Organization of American States and the German Agency for Technical Cooperation. Training was provided for 164 participants from 22 countries last year. In addition to training, CICP provides technical assistance to USAID missions and actively promotes research networking in integrated pest management.

"Environmental health and safety are fundamental to productive human activity and to economic growth and development," Koshel stresses. "USAID maintains a strong commitment to safeguarding the quality of life at every opportunity."

The Consortium for International Crop Protection, under an Agency contract, provides technical assistance to USAID missions and promotes research networking in integrated pest management.

Coastal Zones



Coastal zones constitute a complex and diverse array of ecosystems that play an increasingly important role in development. Tourism, trade, shipping and oil industries all rely on some aspect of coastal resources. Fisheries, agriculture and forestry development also affect the coastal zones of countries. These pressures are certain to grow. An estimated two-thirds of the world's people reside along coastlines and along banks of rivers draining into coastal waters. As the Earth's population expands, major increases will take place in coastal cities.

The planting of seagrass helps restore the natural habitat of fish.

Many developing nations already are witnessing—in only two or three decades—the same man-made alterations to their coastal systems that have evolved over many generations in Europe and the United States. The result is degraded water quality, declines in near-shore fish resources and destruction of critically important ecosystems such as estuaries, mangroves, seagrass beds and coral reefs.

Yet, coastal zones—defined not only as shoreline ecosystems and the upland watersheds that drain into coastal waters, but also the banks and continental shelves that extend several hundred kilometers into the sea—are areas of high productivity and rich in biological diversity.

In late 1985, USAID signed a five-year cooperative agreement with the University of Rhode Island (URI) to strengthen coastal resource management capabilities in selected developing countries. Pilot programs now are under way in Ecuador, Thailand and Sri Lanka.

"The objective of these programs is to work with governments and non-governmental organizations in developing national policies and to demonstrate integrated approaches to management of natural resources and economic development in specific coastal areas," says Nora Berwick, manager of the integrated coastal management project in the Bureau for Science and Technology's Office of Forestry, Environment and Natural Resources. "We hope that these programs provide models for other developing nations."

"In developing countries, the emphasis is on sustainable use of resources to promote economic growth without exhausting the system," points out Steven Olsson, director of the project at the University of Rhode Island.

The program in Ecuador was the first to get under way in March 1986. This Andean nation has a coastline with a wide variety of habitats, ranging from desert to humid rain forest and including the unique Galapagos Islands. Ecuador's population has been centered in the interior of the country until this century when the coastal region became commercially important for the production of export crops such as tagua palm, bananas, cacao and coffee.

Guayaquil, a port city at the head of the Guayas Estuary, the largest estuary on the west coast of South America, recently became the country's biggest city.

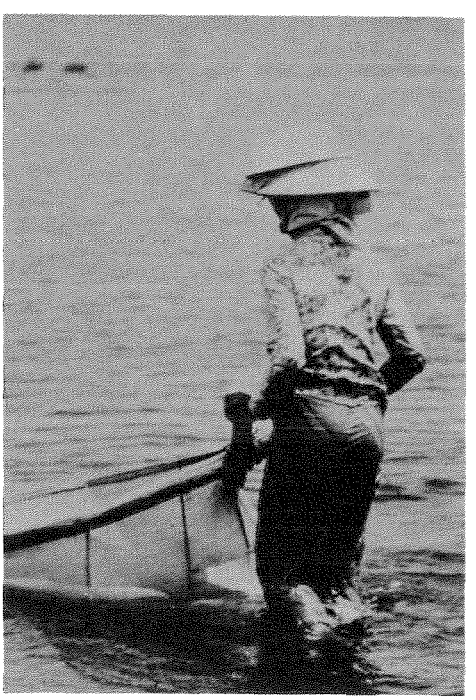
"A priority for the Ecuador project is to assist key governmental and private sector representatives to recognize that many important economic activities are closely linked to environmental quality," Berwick explains. Good water quality, for example, is a precondition for successful shrimp mariculture, which depends on the maintenance of wild shrimp nurseries for juvenile seed stocks. Shrimp are a source of much-needed foreign exchange for Ecuador.

"A decline in the Ecuadorean shrimp industry gave us a window of opportunity to proceed with broader conservation issues," Berwick says. Ecuador had been the world's leading producer of cultured shrimp since 1983 when about 35,600 metric tons of shrimp worth $175 million were produced—virtually all for export to the United States. By 1985, however, production dropped to 30,205 metric tons, raising the urgent need to investigate the causes for the decline.

At the request of the Ecuadorean government, the University of Rhode Island/USAID Coastal Resources Management Project (CRMP), cooperating with the shrimp industry, scientists and government agencies, developed a series of recommendations to promote a sustainable shrimp aquaculture industry. A management strategy was developed for the industry with primary focus on maintaining water quality for shrimp ponds and hatcheries. Efforts now are under way to carry out the plan.

Fundacion Maldonado, a non-governmental organization headquartered in Guayaquil, is developing a regional coastal profile and provincial profiles that will provide the basis for focusing action on critical issues at the local level.

The URI/USAID CRMP pilot in Sri Lanka began in January 1986. As in



Thailand's 3,219 kilometer coastline is exceptionally rich in natural resources.

Ecuador, the population of Sri Lanka historically was concentrated in the highlands. But, by the end of the British colonial period in 1947, three-quarters of the population was settled along the coast. Although tea grown in the highlands remains the major export, lowland crops such as bananas, coconut and sugarcane have become important. Tourism, based on the island's plentiful beaches, has become an important economic activity.

As Sri Lanka's population crowds along the coasts, accretion and natural processes of coastal erosion are creating problems.

For decades it has been national policy to "hold the line" against the sea. Coastal resources management legislation was enacted by the Sri Lanka parliament in 1981, mandating the Coast Conservation Department (CCD) to develop a comprehensive approach to coastal management by October 1986. In 1983, the CCD began to implement a permit program for shorefront construction.

When the URI/USAID program began, the CCD already had made considerable progress in formulating the conceptual framework for the national coastal zone management plan, defining the issues the plan would address and developing a comprehensive erosion management strategy.

During the pilot program's first year, assistance was provided in drafting the national plan, which contains management strategies for coastal erosion, protection of natural coastal habitats, and preservation of historic and cultural sites within the coastal zone. The plan also marks off a setback line for future construction activities, identifies specific features for preservation, and outlines the CCD's research and planning agenda for making coastal management in Sri Lanka more comprehensive.

One of the major initial activities sponsored by the URI/USAID coastal program was directed at developing a consensus among government agencies and private groups on the causes of habitat destruction and the priorities for immediate action, planning and research.

Coastal habitats were defined to include coral reefs, estuaries, lagoons, mangroves, salt marshes, seagrass beds, coastal sand dunes, barrier beaches and barrier spits. A report integrating available information on coastal habitats specific to Sri Lanka and priorities for management and research was prepared by selected faculty from Sri Lankan universities. In addition, coastal habitats were defined using available aerial photography and maps by a team at the Sri Lanka Survey Department. The URI/USAID cooperative agreement also provides training in practical aspects of fisheries development and management, benefiting a number of African, Asian and Latin American students.

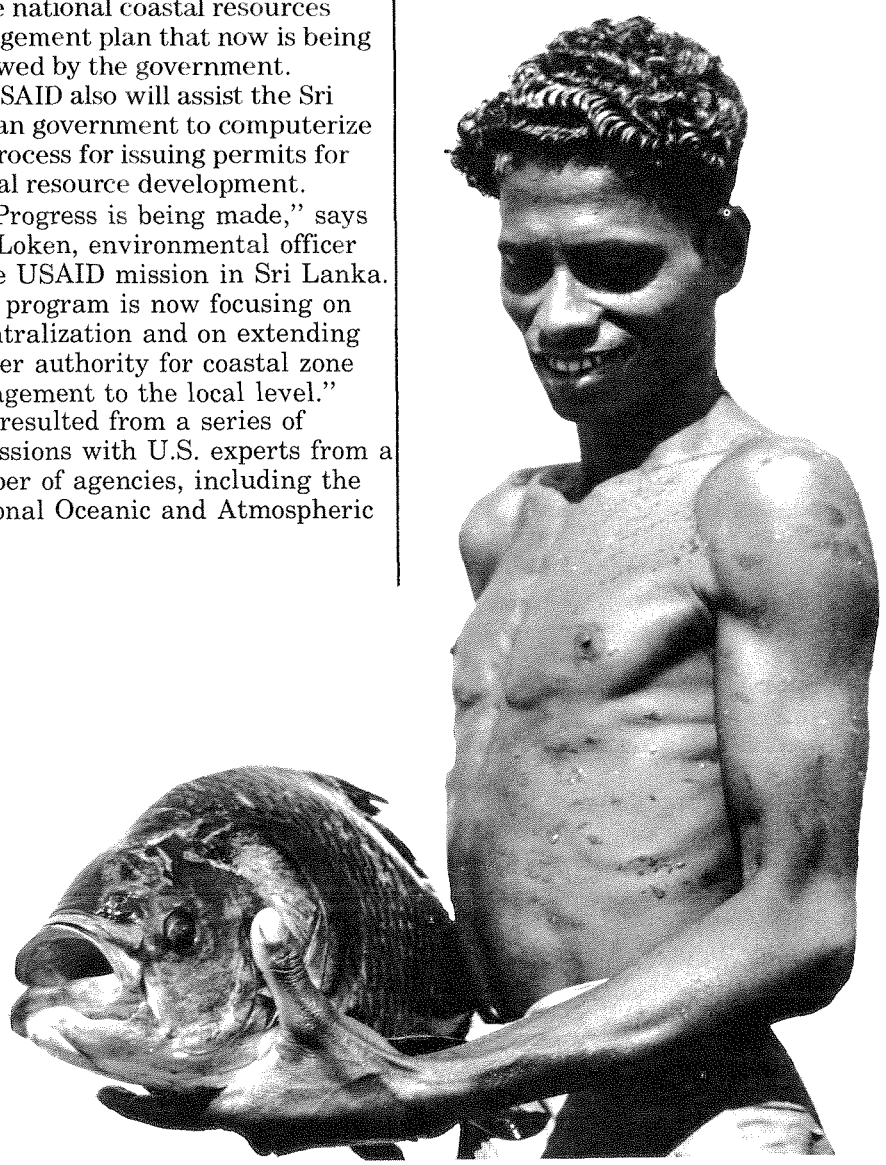
A USAID-supported critical habitat workshop in May 1986 brought together 49 representatives of government agencies, universities and private organizations for a four-day session in Colombo. The workshop helped identify issues that were integrated into the draft of the national coastal resources management plan that now is being reviewed by the government.

USAID also will assist the Sri Lankan government to computerize the process for issuing permits for coastal resource development.

"Progress is being made," says Eric Loken, environmental officer in the USAID mission in Sri Lanka. "The program is now focusing on decentralization and on extending greater authority for coastal zone management to the local level." This resulted from a series of discussions with U.S. experts from a number of agencies, including the National Oceanic and Atmospheric Administration and the National Marine Fisheries Service.

In Thailand, USAID also has provided support for a coastal resources management plan. The first major activity of the project started in December 1986 with a visit by 11 Thai government officials to the United States to learn about coastal management and to relate the U.S. experience to the design of a national Thai coastal resources management plan.

Thailand's 3,219-kilometer coastline is exceptionally rich in natural resources. Fisheries, mineral deposits, mangrove forests and coastal tourism contribute significantly to national economic development. These resources are used by a wide variety of groups, and many government



With increasing populations and rapid economic growth, the exploitation of coastal resources has led to environmental degradation.

agencies are involved in various aspects of their management.

"Coastal zone management is a priority for Thailand's Sixth (five-year) National Economic and Social Development Plan that went into effect in 1986, and the country has already undertaken a number of initiatives in this area," USAID/ Thailand Mission Director John Eriksson notes. Site-specific plans for tourism and shorefront industrialization schemes have been prepared by the central government. Marine parks have been created, and studies on coastal resources and management issues have been completed.

The primary objective of the URI/ USAID coastal resources management project in Thailand is to help the government develop national policy and management techniques that are viable. Provincial-level action plans will be the vehicle for developing and testing implementation techniques.

The province of Phuket will be the site of the first action plan. Phuket is recognized as one of the world's most beautiful spots and is a major tourist attraction. "Development is proceeding rapidly and threatens to spoil the coast's beauty," adds Olsson. "The coastal issues of national significance facing Phuket include conservation of the island's magnificent scenery and resources—mangroves, coral reefs, seagrass beds and fisheries. The effects of development, tourism, logging and tin mining also are raising concerns."

Other ASEAN (Association of Southeast Asian Nations) countries—such as Indonesia, Malaysia, the Philippines, and Singapore—also are highly dependent on coastal resources.

With increasing populations and rapid economic growth in these countries, the exploitation of coastal resources has led to environmental degradation as well as to conflicts in the use of such resources as fisheries, mangroves, coral reefs, seagrass beds, swamplands, peat bogs, estuaries and islands that provide a principal source of both food and livelihood. To increase the capabilities of ASEAN nations to better manage their coastal resources, USAID set up a Coastal Resources Management Project (CRMP).

Coastal resources management plans include resource assessment, cooperative research and planning activities.

"CRMP was initiated in 1985 to help ensure the long-term productivity of coastal fisheries and aquaculture, mariculture, forestry and other forms of primary-resource-dependent development," says Bruce Blackman, ASEAN project officer in Manila.

Funded by USAID for four years, CRMP is being carried out by the Philippines-based International Center for Living Aquatic Resources Management (ICLARM). The project's steering committee is composed of representatives from each of the ASEAN nations and is responsible for overall project policy direction. ICLARM provides technical and administrative support and facilitates overall project implementation.

CRMP has two parts. The first is the development of coastal resources management plans for specific areas in the respective countries. This includes resource assessment, cooperative research and planning activities. The second component includes information dissemination and training activities.

The project is conducted by institutions in ASEAN countries with ICLARM help at sites in Indonesia, the Philippines, Thailand and Singapore.

As a first step in developing coastal resources management plans, each of the ASEAN nations has scheduled one or more national workshops to discuss issues and set the policies to guide national activities.

Coastal profiles will be prepared in each of the countries. They will serve as preliminary analyses for the development of management strategies. A master's-level program in marine science at U.S. universities also is planned to help expand the technical skills of future ASEAN coastal resource management specialists.

"We are pooling expertise by encouraging collaborative efforts among these coastal management programs," says Berwick. The first in a series of planned collaborative workshops was held in Thailand in March.

"USAID's initiatives in the management of coastal zone resources," she says, "reflect the Agency's comprehensive approach to address the need to link development with conservation of the environment and the natural resource base."

international organizations in their efforts to conserve tropical forests.

"USAID works closely with U.S. agencies such as the Forest Service of the U.S. Department of Agriculture and the Peace Corps to expand the expertise and scope of its forestry programs," Vanderryn says. In 1981, USAID and the USDA Forest Service created the Forestry Support Program (FSP) through which foresters advise USAID in a variety of fields.

In training, for example, the Forestry Support Program organizes courses, develops educational materials and advises forestry schools. Last year, training plans were completed for St. Vincent, the Grenadines and India. Eighteen faculty members from Indian state agricultural universities spent a year in U.S. universities as part of an effort to strengthen forestry education programs in that nation. The Forestry Support Program also conducted training sessions and initiated and now supports the University of Michigan School of Natural Resources' International Seminars on Forest Administration and Management.

Since 1980, USAID and the Peace Corps have also collaborated in forestry. The Peace Corps now has more than 600 volunteers working in the forestry and natural resources sector in more than 40 countries. In 1985, USAID's P.L. 480 forestry program became linked more closely with the Peace Corps program. "This has excellent prospects for significantly increasing the development impact of P.L. 480-supported agroforestry and reforestation projects," Vanderryn adds.

"The decline in the overall stability and productivity of Africa's natural resource base has increasingly become a source of global concern," notes Tim Resch, Africa coordinator for the forestry support program. Experts estimate that Africa's forests have been reduced by half during this century and that the rate of deforestation is accelerating despite reforestation efforts. The pressures of population growth have forced more extensive clearing of land for agriculture and expanded use of forest resources for fuelwood and charcoal harvesting.

To more effectively address Africa's natural resource needs, USAID recently developed a *Plan to Support Natural Resource Management in Sub-Saharan Africa.* It is designed to integrate natural resource activities into agricultural and rural development programs, a "lessons learned" from careful analysis of the results of reforestation programs undertaken in Africa's Sahel region in the late 1970s.

Fast-growing trees such as the Leucaena leucocephala, Albizia falcataria, Acacia albida and Gmelina arborea can help reverse accelerated deforestation in developing countries.

USAID seeks to better integrate agriculture and forestry programs and to promote tree planting. Community-based agroforestry and tree-planting activities are now beginning to make modest progress in a number of African countries.

In Niger, for example, significant gains have been made in the CARE/USAID Majjia Valley Windbreak project. The project began in 1974 in a then wind-eroded valley in the south-central part of the country. The use of windbreaks had been proposed by two Nigerian foresters.

Once an ancient seabed, the Majjia is highly fertile for agriculture and is home to some 33,000 people who make their living from planting crops such as millet, sorghum, cowpeas, okra and calabash, as well as by raising livestock.

"Due to the drought of the early 1970s and the extensive cutting of natural vegetation, Majjia Valley farmers were losing valuable agricultural land to wind erosion," notes Resch. "Increasing population growth was also contributing to the decreasing supply of firewood in the valley."

Initial windbreak planting with neem *(Azadirachta indica)* trees began in 1975. The windbreaks consisted of double rows of neem spaced four meters (13 feet) apart with 100 meters (330 feet) between double rows.

With the cooperation of the government of Niger, over 500 kilometers of windbreaks were planted, resulting, in some years, in a 20% increase in millet and sorghum yields in protected fields. Though initially a number of villagers were reluctant to give up some of their land for the project, its success has already led farmers in adjacent areas to ask for

A Data Base for the Ruhengeri

The Ruhengeri district of Rwanda contains some of the most productive agricultural regions in the small central African nation. It also holds the major high altitude wetlands that control water flow into Rwanda's two largest interior lakes as well as into the Mukungwa watershed. The watershed links with the Virunga montane forest park, which together with the Parc National des Volcanes is home for the endangered mountain gorilla.

More than half of the forested area of the Virunga Reserve disappeared in the last 25 years. Demand for firewood and bamboo poles continues to chip away at the fragile forest. The wetlands have been exploited, resulting in a decline in the quantity and quality of water resources.

Working with the South-East Consortium for International Development, USAID undertook the first systematic effort to compile an environmental data base and assessment of environmental trends in the Ruhengeri. It now serves as a model for other districts in Africa.

"We analyzed a local problem that greatly influenced the national park. We identified resource needs among the local population and examined agricultural productivity, soil erosion, forestry and wood use," says Bessie Boyd, environmental officer for Africa. "We are moving ahead to put together specific activities to reduce soil erosion and improve watershed stability."

windbreaks and to offer their labor free to plant them. In response to their requests, the government is planting 170 additional kilometers of windbreaks this year.

"The Majjia Valley project has broken new ground in testing and demonstrating the effectiveness of neem tree shelterbelts as a technique to reduce soil erosion from wind and rain, increase crop yields and produce valuable polewood and fuelwood," notes Resch. "The growing strands of neem trees also provide a supplementary source of fuelwood for the community."

In Burundi, an innovative USAID project launched in 1982 has as its aim to preserve one of the last remnant montane forests while generating new sources of firewood and construction timber through reforestation of the surrounding area. The Bururi forest is home to a number of endangered species including a small population of chimpanzees and birds such as the black and white casqued hornbill and Ross's tourac.

Human exploitation has resulted in the clearing of all but less than 400 square kilometers of a forest that once covered one-third of the total area of the country. The remaining montane forest zone now covers only 1.4% of the national territory and is subdivided into three discontinuous patches: the Kibira-north, Kibira-Teza and the Bururi Forest.

The Bururi Forest, some 1,600 hectares of natural montane vegetation, runs nearly 300 kilometers from the Virunga volcanoes in Rwanda south to Bururi. The forest plays a critical role in water catchment and regulation and in 1912 was granted special reserve status.

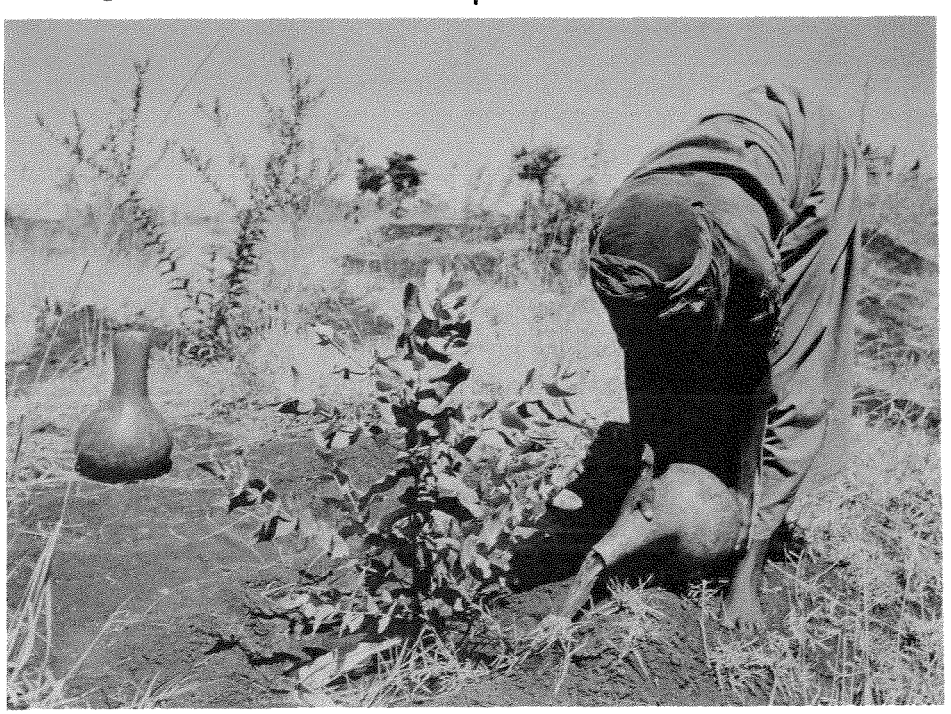
The USAID project was expected to save 1,600 hectares of forest by surrounding it with 750 hectares of fast-growing trees to be used for fuelwood and building poles. This helped reduce soil erosion and increase the availability of alternative fuelwood sources.

The project set up a nursery and conducted germination and growth studies for some 18 tree species. To date, 37,000 seedlings have been distributed to local residents for agroforestry and other needs and 5,600 seedlings were distributed to schools for fuelwood and construction. A 1,200-seedling trial plantation using nitrogen-fixing species has also been planted.

In 1982, USAID's Kenya Renewable Energy Project (KREDP) set out to stimulate renewable energy technology and to promote reforestation and fuelwood conservation. In largely arid and semi-arid Kenya, some 85% of the energy needs are met through fuelwood.

Under KREDP, more than 6.75 million trees were planted within five years. A total of 125 species were evaluated in nursery production, and 93 screening trials were conducted as well as 300 on-farm trials throughout 21 districts.

Agroforestry research and training facilities were set up at Egerton College, the University of Nairobi and Moi University, and long-term training was provided for six master of science degrees.



Despite reforestation efforts, the rate of deforestation is accelerating in Africa.

"The aim of USAID's forestry program is to help developing countries more efficiently manage their forests, woodlands, range and other wildland resources."

project, developed more efficient wood and charcoal stoves and now manufactures and sells about 150,000 units a year.

The energy project involved a broad range of Kenyan governmental and non-governmental organizations in the reforestation effort.

KREDP is administered on the national level by the Ministry of Energy in cooperation with the ministries of Agriculture and Livestock Development and Environment and Natural Resources as well as the Kenya Energy Non-Government Organizations' Association. Six agroforestry/energy centers were established to coordinate regional programs under KREDP, and over 60 local programs were conducted.

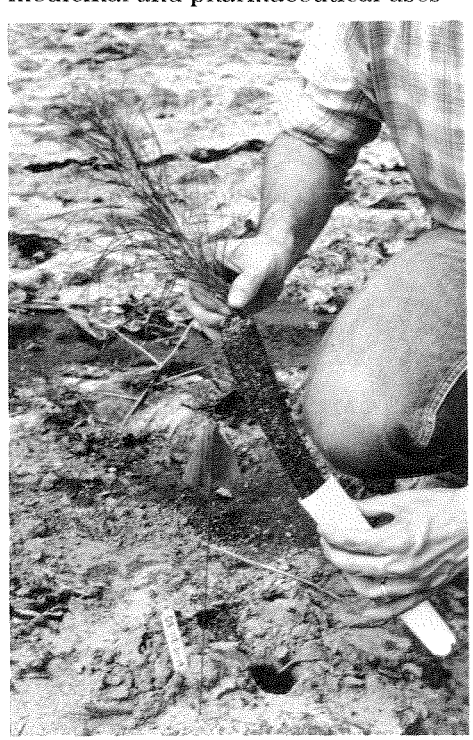
"The project has helped Kenyan governmental and private sector organizations to mobilize for spontaneous tree planting activities and improving agricultural productivity as well as meeting fuelwood needs," notes Resch.

Deforestation is also a serious concern in Latin America. Most of Central America, for example, was once covered by forests. Yet, by 1970, only 49% of the region was forested. The rate of deforestation is rapidly accelerating. The major cause of deforestation in Central America is the conversion of forest lands to agriculture, though the demand for fuelwood and commercial logging also contributes to resource depletion.

Since 1980, USAID has helped support the Fuelwood and Alternative Energy project, a five-year regional effort based at the Center for Research and Training in Tropical Agriculture (CATIE) in Costa Rica. The project has helped determine tree species suitable for small farmers to plant for fuelwood. It also analyzed the best growing techniques and critical areas of fuelwood demand. Trials conducted throughout Central America identified 30 promising tree species now being adopted by farmers.

Sustained yield management of tropical forests may reduce the rate of tropical deforestation by diminishing the pressure to convert forests into agricultural or grazing lands. An innovative approach to managing tropical jungles for sustained production has been developed through USAID's Central Selva Natural Resources Management project in Peru.

Peru's Palcazu Valley is one of the last valleys on the eastern flank of the Andes before the Amazon basin. Tropical rain forest covers 85% of the lower valley — 75% of it represents primary forest cover. USAID-supported studies have revealed a large number of plant species with medicinal and pharmaceutical uses and at least 1,000 native tree species.



More than 120 local PVOs participate in the reforestation effort.

As part of the Central Selva Natural Resources Management project, USAID is helping to create and consolidate the 1,330-square kilometer Yanachaga-Chemillen National Park and the 33-square kilometer San Matias Protection Zone. These protected areas include substantial areas of forests on the steep slopes of the upper Palcazu watershed.

The soils of the valley are thin and poor and extremely acidic because of the abundance of aluminum. They are subject to erosion when stripped of protective forest and used for agriculture or pasture.

Increasing market demand for a wide range of wood species has led to the need for improved forest management. "Markets traditionally accepted only the finest woods—from some 50 native tropical tree species," says Vanderryn. "In the last 10 years, this has changed. With the depletion of accessible stocks of previous woods in the tropics, markets are opening up for lesser-known woods. This calls for intensive sustainable management of forest resources to prevent them from being lost."

The Tropical Science Center, a private, non-profit organization based in Costa Rica, designed a management plan for each of the two principal soil/landform types in the Palcazu Valley—red clay soils on rolling hills and white sandy clay loam.

On red clay exploitation is restricted to long, narrow clearcuts called strip shelterbelts. Each strip is 20-50 meters wide, with strip length determined by topography and logistics. When possible, the 200- to 500-meter strips are oriented with

"USAID-supported studies have revealed at least 1,000 native tree species in Peru's Palcazu Valley."

the topography to minimize crossing ridges and streams.

"What we have are elongated gaps bordered on each side by intact forest that is the source of seeds for natural regeneration of trees in the exploited strip," explains Vanderryn. "Each successive strip is located at least 200 meters from recently cut strips so as to ensure adequate sources of intact forest for natural regeneration." Every sixth strip will be left as a permanent reserve of primary forest.

The Tropical Science Center is projecting a rotation of 30 years between harvests of a particular strip.

On the infertile white, sandy clay-loam soils, regeneration of two important naturally occurring tree species—rubber *(Hevea brasiliensis)* and a premium timber *(Cedrelinga catenaeformis)* will be managed on a group selection basis. That is, gaps some 200- to 500-square meters in size will be created by felling all trees in the area to stimulate regeneration of these two species. The gaps will be sufficiently spaced so that each is surrounded by intact forest for natural regeneration by seed.

"The most significant aspect of the project is the opportunity for sustained development of the valley, rather than the typical boom-bust pattern of traditional forest exploitation," Vanderryn says. "Not only will the predominately Indian residents of the valley generate adequate income from sustained yield forest management, but pressure to convert forests to agricultural crops and pastures will be reduced."

Community-based agroforestry and tree-planting activities are beginning to make modest progress in a number of countries.

In Latin America and the Caribbean, steeply sloping lands and humic tropical lowlands are fragile lands whose potential to provide a livelihood to the people who live on them is at risk.

USAID addresses the problems of land degradation by encouraging sound management practices in development projects.

To expand the base of technical expertise available to Latin America in the area of managing fragile lands the 10-year Development Strategies for Fragile Lands (DESFIL) project was initiated in 1986. It is part of a broader USAID initiative that combines the activities of technical projects such as those in forestry, soils, environmental planning, development management and social/institutional analysis into a programmati focus on fragile lands. The DESFIL project coordinates these efforts. It also adds its own expertise including providing technical support and advisors to USAID missions and governments in the region to develop national policies to support the sustainable development of fragile lands and to build an institutional capability to better manage them.

To date, DESFIL has placed tw long-term advisors in Haiti to work with the Technical Secretariat for Watershed Management (STAB) in the Ministry of Agriculture, Natural Resources and Rural Development. STAB is designing a strategy for the sustainable development of the fragile lands found on the steep hillside of Haiti's watersheds. In St. Kitts, DESFIL will place two long-term advisors—a land-use/environmenta expert and an environmental officer to work on a project aimed at developing tourism in the southeastern peninsula area of the country. Early this summer, DESFIL designed a project for the sustainable development of the tropical valleys of Coch

water as the topsoil collected in the riverbeds. Run-off after heavy tropical rains destroyed riverbeds, irrigation canals and fertile, alluvial agricultural land. The resulting unproductive land means less potential for economic growth.

In 1981, USAID launched an $8 million Agroforestry Outreach Project to promote the planting of trees as a cash crop. The project was based on a sociocultural analysis of needs and attitudes of Haitian farmers and was coordinated by U.S. private voluntary organizations (PVOs) in close cooperation with private groups in Haiti.

The Agency awarded grants to the Pan American Development Foundation (PADF) and CARE to carry out the training and supervision of extension workers, to promote the construction of regional nurseries and to arrange for the planting, distribution and care of hardwood tree seedlings. A third PVO, Operation Double Harvest, received a grant to produce the first tree seedlings. The Agroforestry Outreach Project is funded through 1989.

Networking with Local PVOs

The PADF effort in Haiti was baptized "Proje Pyebwa'—Creole for "tree-planting project." In addition to the USAID grant, the foundation also obtained support from Canadian, Belgian and Swiss government agencies as well as from corporate and individual contributors.

To reach as many farmers as possible, PADF made subgrants to more than 120 Haitian PVOs, including a number of church-affiliated groups. Each rainy season—spring and fall—some 80 local PVOs designate "promoters" who are trained to help very poor farmers plant and care for new trees as a crop on their own small holdings. PADF helps counterpart PVOs to cooperate on deliveries of desired exotic and native tree seedlings and

Grafted fruit trees developed by the Organization for the Rehabilitation of the Environment with USAID support increase production and provide erosion control.

to train extension agents to explain the program to farmers. Results of the plantings are carefully monitored.

The project introduced new nursery technology. A Canadian manufactured small-root trainer system, selected for tree germination, produced seedlings requiring much less dirt, making them easier to carry and plant than those that are traditionally germinated in plastic bags. "Farmers can now carry 250 at a time up the steep slopes whereas before they could only carry 20," says PADF Program Director Phoebe Lansdale.

"By culture and experience, farmers are market-oriented. In Haiti they more readily accepted trees as a source of income than for any ecological advantage," says Proje Pyebwa Director Glenn Smucker.

PADF identified ways to expand the range of profitable uses for the trees. The most obvious use was for charcoal, but planting new trees for fuelwood, living fences, shade, forage, green manure, construction poles and terracing to capture agricultural soils now is common in Haiti.

By the end of 1986, the PADF project had planted nearly 20 million trees with a survival rate of 50%. Over 85,000 Haitian farmers have been involved in the reforestation effort.

"The success of the program so far is closely linked to our sustained cooperation with selected committed PVOs and Haitian promoters," says Lansdale. "They have ties to the scattered small landholders who

"The multiplier effect generated by the project and the enthusiasm demonstrated by farmers for planting may make a key difference in Haiti's economic future."

know them and respect their advice. They arrange for the transfer of seedlings to the farmers and keep track of how the trees fare and how the farmers care for them."

Outreach in the Arid Northwest

Deforestation and erosion have reached a particularly advanced, debilitating stage in northwest Haiti, the country's charcoal-producing region. Too many people have been attempting subsistence farming on plots of land that are too small—usually less than one acre. Most of the forests have been cleared for cropland and charcoal to supplement income. The last of the virgin forests disappeared in this area in 1978.

CARE's agroforestry effort in the region seeks to curb erosion, produce fruit and supply farmers with fuelwood. It emphasizes extension and training by building on an existing community-based network of extension workers.

"An effective community-based extension network is the key to disseminating new and appropriate technologies," says John Michael Kramer, CARE's director of agroforestry.

CARE has helped more than 4,000 farm families in the region produce 5.2 million seedlings since 1981. Seedlings were recently generated at the rate of nearly two million trees yearly, using the resources of 27 nurseries. This year, CARE will help set up 12 more nurseries to provide multipurpose and fruit tree species desired by farmers and suitable for their small holdings. Five popular species, for example, are nitrogen-fixing that also support crop growth.

The effort has resulted in 35 miles of live hedgerows being planted on desertified land, providing soil and water conservation for slopes of up to 55%. Some 500 additional acres of hedgerows will be planted this year.

It is estimated that 11 million hectares of tropical forest are cleared annually.

While PADF operates through a PVO network, the CARE staff directly provides formal and informal training both to local project staff and village extension workers who, in turn, train participating farmers.

"Despite losses suffered due to drought, foraging animals and other factors, the agroforestry outreach program has been successful," says James Hester, chief environmental officer in the Bureau for Latin America and the Caribbean. The project quickly surpassed its original four-year goal of getting farmers to plant three million trees.

The project also was effective in identifying tree species best adapted to the arid Haitian climate, the fragile soils and steep slopes. Farmers are asking for precious mahoganies and fruit trees to be included because these are considered traditional and reliable sources of income. They also welcome trees that can be coppiced—those that regrow after cutting near the base. There already is some evidence of improvement of crop yields as a result of new techniques in contour planting, green manure crops and soil stabilization.

While Haiti's planting rate is still far short of the annual cutting rate of some 40 million trees per year, the rate of deforestation is being slowed significantly. The multiplier effect generated by the project and the enthusiasm demonstrated by farmers for planting may make a key difference in Haiti's economic future.

The Challenge Ahead

The United States has a wealth of experience and knowledge in addressing environmental protection issues and in managing natural resources. We have an extensive body of law, administrative mechanisms, governmental agencies, educational and research institutions and the most effective array of non-governmental environmental organizations in the world.

It is therefore essential that the U.S. environmental ethic should be an integral part of the U.S. foreign assistance program, reflecting our national environmental policy and the strength of our institutions and scientific talent.

USAID will continue to take a leadership role in linking conservation of natural resources and environmental protection with economic development in the Third World because we are convinced that this is the best way to meet the challenge of providing for the present and future needs of all people. Maintenance of the natural resource base, for example, is a major component of the Agency's new focus for its agricultural program.

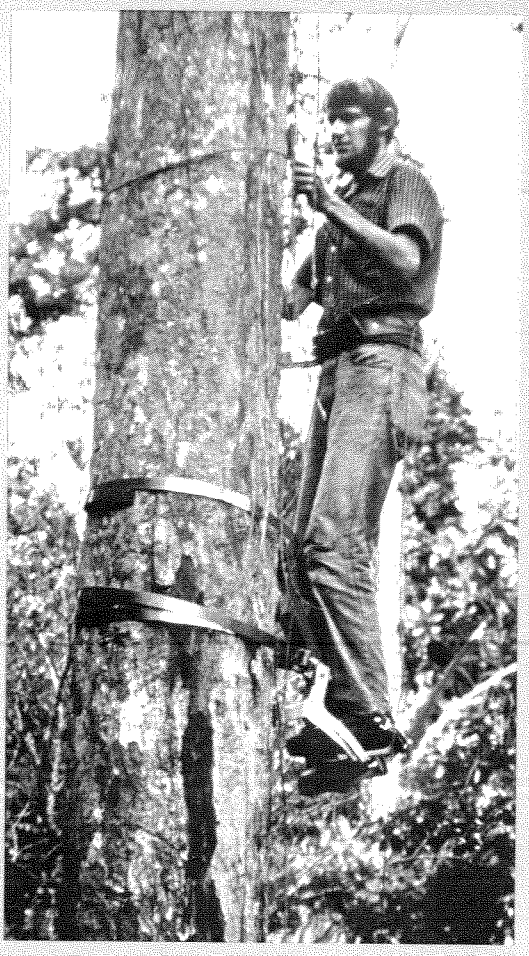
We will continue to find better ways to integrate environmental concerns into every facet of the development process, to enhance and strengthen our role in the conservation of tropical forests and biological diversity, and to encourage governments and other donor agencies to take comparable actions. We also will continue to help build self-reliant environmental institutions, train tomorrow's environmental leaders and promote scientific research to expand the promise of a prosperous future for the host countries with whom we work.

The basis of USAID's strength lies in large part with its technical staff. Over the past decade we have expanded the number of environmental professionals in both our Foreign Service and Civil Service, established an Office of Forestry, Environment and Natural Resources as well as an Agency Sector Council for Energy and Natural Resources that provides a forum for professional interaction and promotion of Agency goals. We intend to increase our technical resources through recruitment in the field and in Washington and by providing both short- and long-term training to existing staff.

Our strength also is in our ability to tap the rich resources of other federal agencies, the state land-grant and private university systems, the business community and non-profit private voluntary and environmental organizations. Many are working with us as valued partners in promoting the concept of sustainable development.

Environmental factors must be an integral part of every activity of the U.S. foreign assistance program. No real progress can be made if natural resources are in peril. No prosperity can endure without protection of our natural heritage.

by Nyle Brady



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