

- riculture. New Delhi, India, Feb. 6-10, 1990.
- Eswaran, H., S.M. Virmani, and L.D. Spivey, 1991. *Sustainable Agriculture in Developing Countries: Constraints, Challenges and Choices*. Special publication, American Society of Agronomy.
- Jodha, N.S., 1989. "Mountain Agriculture: Search for Sustainability." Newsletter ICIMOD, Nepal. No. 11.
- Postel, S., 1989. Halting land degradation. pp. 21-40. "L.R. Perspectives on Land Ecology and Development," in *Lands at Risk in the Third World: Local Level Perspectives*. P.D. Little, M.M. Harowitz, and A.E. Nyerges (Eds.). Westview Press, Boulder, CO.
- Singh, R.P., J.F. Parr, and B.A. Stewart, 1990, (Eds). "Dryland Agriculture: Strategies and Sustainability." *Advances in Soil Science 13*: 373 pp. Springer-Verlag.
- Virmani, S.M., and H. Eswaran, 1989. "Concepts for Sustainability of Improved Farming Systems in the Semi-Arid Regions of Developing Countries," Int. Conf. on Soil Quality in Semi-arid Agriculture, Saskatoon, Canada.
- Virmani, S.M. and H. Eswaran, 1990. "Characterization of Natural Resources for Sustainable Dryland Agriculture." Proc. Int. Symposium on Natural Resource Management for Sustainable Agriculture, New Delhi, India, Feb. 6-10, 1990. ■

International Cooperation To Protect Our Productive Environment

28

by Julia M. Morris, Program Coordinator for Africa, Forest Service, USDA, Washington, DC

In recent years, people around the world have come to acknowledge the importance of our natural environment and its sensitivity to the effects of humans' actions. Holes in the ozone layer over Antarctica, spreading deserts in Africa, acid rain in eastern Europe, and deforestation in Brazil—all are subjects many Americans hear of daily. At the same time, we are

learning that productive agriculture and forestry are necessary for the development of strong economies in all countries.

As global environmental changes cause critical ecological, economic, and social consequences, USDA is increasingly called upon to apply its experience around the world. As political barriers disappear, inter-

national networks of scientists are emerging to support the development of a sustainable global agricultural system—a system that will produce enough to feed the world into the future, yet that will not destroy the land and its fertility that make such production possible.

Cooperation: A Two Way Street

The U.S. land-grant colleges, in existence since 1864, and the National Forest System, observing its Centennial in 1991, reflect a rich national tradition in agriculture and natural resource management which the United States can offer to neighbors around the world. This unique U.S. capacity can contribute to international agricultural research, education, and development projects of institutions and agencies in other countries.

U.S. participation in international activities contributes not only to global knowledge, but also to our own domestic programs. At the same time that our resources and experiences benefit programs overseas, the lessons we learn in tackling new problems and different situations elsewhere help us find creative solutions to challenges right here at home. Opportunities to combine research efforts, gain new technical experience in the field, and participate in innovative training programs allow U.S. scientists to improve how they manage the forest and

farm land in the United States.

As the Earth experiences an ever-growing demand for goods and services from a limited resource base, the need to share knowledge and skills in meeting that demand grows. Sharing professional expertise and scientific talents with colleagues around the world will contribute to the development process in all countries, including our own, by improving people's health and nutritional status, fueling economic growth, and political stability.

International cooperation and assistance fall into several categories, including government discussions on policy, cooperative research, scientific and technological exchange, training, and technical assistance. In each area, USDA has a long history and valued expertise in linking technological development to field application, in managing natural resources by interdisciplinary approaches, and in exercising the general management skills necessary to run a national agency. This USDA expertise represents a valuable resource for colleagues abroad.

Soil Conservation in The Gambia

For over 10 years the USDA Soil Conservation Service, working through the USDA Office of International Cooperation and Development, has helped to develop the Soil and Water Management

Unit of the Department of Agriculture of the tiny West African nation of The Gambia.

In a country dependent on agricultural exports for three-quarters of its foreign exchange earnings, greater population pressure and increasingly irregular rainfall patterns threaten the long-term sustainability of the agricultural production systems. SCS has helped train government extension agents and rural farmers to manage valuable water resources.

Through the design and construction of small earthen dams, the Gambian Soil and Water Management Unit has helped to reclaim thousands of acres of rainfed rice fields, previously abandoned because of contamination with salts. These fields, traditionally farmed by women to produce the staple of the family diet, will help to ensure the survival of the rural household. On the men's upland millet and peanut fields, SCS staff and their Gambian counterparts have incorporated soil erosion controls into the traditional farming system, preventing the precious topsoil from being washed away.

The Soviet Union— Valuable Scientific Exchange

The Soviet Union has 2.3 billion acres of forest—one-third of the world's total. Dozens of forest research institutes are found across this mammoth expanse of forest, along with many excellent forest

scientists. This combination of natural and human resources offers exciting opportunities for U.S. forest scientists and forest managers to expand their understanding of forests of temperate and subarctic zones. Interaction between U.S. and Soviet foresters builds networks that can also foster private sector cooperation. For example, imports of Soviet timber into the United States are being actively sought by U.S. forest products companies. These can offset reduced harvests in this country and keep mills operating at efficient levels.

Recognizing the benefits that the United States will gain by cooperating with the Soviet Union,



Soviet Forest Ministry scientists performing climate change research in the Boundary Waters Region of the Superior National Forest, MN.

Bernie Yee/USDA 90BW1699-9

the USDA has signed an agreement with the Soviet Union creating a working group on forestry, which is administered in this country by the Forest Service.

Among the activities carried out through this agreement were exchange visits by four teams of U.S. forest scientists who went to the Soviet Union in 1990. One team of scientists investigated ways to reduce the dangers of encounters between people and bears in forests, including the use of specially trained dogs to chase bears away from areas where people are present. The Soviets have pioneered this way of managing bears near human habitation.

Another team studied Soviet windbreaks that are designed to control erosion and improve crop yields. A third team carried out research on the importance of small animal predators in controlling gypsy moths, a moth which has damaged forests across the Eastern United States. The fourth team joined with the Soviets to establish research plots north of the Arctic Circle. The research plots will help scientists detect changes in the tundra forest that may be due to global climate change.

The U.S. scientists have also welcomed visits to this country. After the research plots were established north of the Arctic Circle in the Soviet Union, the Soviet scientists followed the U.S. team back to the United States for

further cooperation. A second Soviet team also came to the United States—this one to learn about different methods of forest fire control.

Honduras—Applications of Technical Experiences

In the Central American nation of Honduras, the agricultural sector accounts for nearly half of the total gross domestic product. In spite of low technology levels and relatively poor productivity, Honduran agriculture, forestry, and fisheries consistently provide around 75 percent of national export earnings.

In this context, the USDA Forest Service and the Honduran Forest Development Corporation (COHDEFOR) are working together to implement a principal component of the Honduran Forestry Development Project. Their goal is to increase sustainable yields of timber production and improve management of the country's natural pine forests. Activities will focus on the reorganization of COHDEFOR; pilot forest management programs demonstrating soil conservation, range management, and agroforestry practices for local populations; and encouragement of more private sector forestry enterprises.

Through the activities of the project, farmers will reduce their dependence on extracted products of the natural forest and increase their farm yields and income. At

the same time, the sustainable productivity of the timber industry will be improved by a variety of project activities. These include: new timber sales systems, standards for grading timber products, privatization of industries, and application of more efficient processing technologies. The project has sponsored visits to the United States by members of public and private sector forest industries to expose the participants to cost-effective management and technologies and to initiate dialogue within the Honduran industrial sector.

The Global Environment— Drawing Closer

USDA's participation in international agricultural, environmental, and natural resource management

activities is increasing. In addition to a range of projects such as those described above, USDA also contributes to policy decisions of international organizations and to the formulation of U.S. policy on global change topics.

USDA's involvement has many positive effects, not only in the foreign countries where we work but within our own country as well. As we provide ideas to organizations that decide international policies, we also shape our own.

The friendly international atmosphere created by this kind of scientific and technological exchange, and the skills and knowledge gained by U.S. scientists, increase the chances of resolving some of the major environmental challenges that confront human beings and the Earth. ■

Geographic Information Systems for Managing Resources

29

by Gale W. TeSelle, Director, Cartography and GIS Division, Soil Conservation Service, USDA, Washington, DC

Assisting the private landowners and land users in the wise management of their natural resources (soil, water, air, plants, and animals), is the primary mission of the Soil Conservation Service

(SCS). Helping land users implement the best management practices to minimize off-site impacts of their agricultural activities, particularly the effects of nutrients and pesticides on ground and sur-