Conservation of India's Plant Genetic Resources: USAID's Largest Biodiversity Activity

by Mark A. Smith and Andrea Y. Blumberg

Indian National Genebank at the NBPGR, holding over 103,000 accessions under long-term storage at - 20 degrees C.

India's Wealth of Plant Genetic Resources

India is richly endowed with genetic diversity in crops, possessing at least 160 domesticated species and twice that number of their wild and weedy relatives. The organization responsible for conservation and management of India's plant germplasm activities, the National Bureau for Plant Genetic Resources (NBPGR), not only coordinates India's activities, but is emerging as a regional and international force. The U.S. Agency for International Development (USAID) and the Government of India (GOI) have entered into a $2 1.66 million agreement to strengthen NBPGR capabilities and internal linkages for management of national plant genetic resources as well as for increasing its role in regional and international activities. NBPGR is the implementing agency.

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India's rich crop genetic diversity is evident in its rice, sugarcane, banana, mango, citrus, eggplant, okra, cucumber, sesame, mungbean, cowpea, pigeon pea, jute, black pepper, ginger, and yams. Primitive landraces and wild related types of these crops occur in India. Rich plant diversity also occurs in the tribal-dominated tracts of India. This is particularly true in northeastern India, the western and the eastern Ghats mountains, and central India where tribes still grow landraces and primitive cultivars of a variety of important crops. These genetic resources are threatened by habitat degradation and their collection and conservation has become a national priority.

India's National Bureau for Plant Genetic Resources

The Indian Council of Agricultural Research (ICAR) responded to the national importance of preserving India's national

plant genetic resources by establishing the NBPGR in August 1976 (the structure of NBPGR is described in detail in DIVERSITY, no.12, pp.14-16, see Figure 1).

Since the NBPGR's inception in 1976, high priority has been given to exploration and collection of economic plants and their wild relatives.

The NBPGR operates through its headquarters on the campus of the Indian Agricultural Research Institute, New Delhi, and through its regional stations located in different agro-climatic zones throughout India as shown in Figure 2 in the same article:

1) Jodhpur-arid-zone;
2) Akola-sub-humid zone;
3) Trichur-humid-tropical zone;
4) Shillong-eastern sub-temperate/ sub-tropical zone; and
5) Bhowali and Shimla-temperate western Himalayan belt.

The Bureau has also created plant exploration base centers at each of these regional stations and also at Srinagar, Cuttack, Hyderabad, Ranchi, and Andaman Islands.

As the model national organization for germplasm conservation, the Bureau maintains links with ICAR crop-based institutes, state agricultural universities, and the All India Crop-Improvement Projects. NBPGR also exchanges germplasm and genetic resources information with more than 70 countries and with institutes of the Consultative Group on International Agricultural Research (CGIAR) system, including the International Board for Plant Genetic Resources (IBPGR). The Office of the Coordinator for South and South East Asia is located in the NBPGR campus. NBPGR has signed a memorandum of understanding with the IBPGR supporting the principle of free exchange of germplasm and information concerning plant genetic resources. NBPGR also serves as the primary repository for the world collection of 12 important crop speties.

Since the NBPGR's inception in 1976, high priority has been given to exploration and collection of economic plants and their wild relatives. One hundred forty-six crop-specific and region-specific explorations were undertaken by the Bureau from 1976-86. Over 50,000 collections were made representing wide genetic variability in wheat, maize, rice, minor millets, tuber crops, cotton, sugarcane, mango, banana, citrus, black pepper, and forages, as well as medicinal plants. Areas explored include the northeastern region, north western Himalayas, drier western plains, central India, and eastern and western peninsular tracts.

To facilitate safe movement of germplasm the Bureau's plant quarantine service processed more than 58,400 samples of planting materials during 1976-86. Concerted efforts are made to save pest-and-pathogen-infested materials using salvage techniques including fumigation, X-ray radiography, hot-water treatment, acid seed treatment, and pesticidal seed treatment. Several important exotic plant pests, nematodes, and pathogens have been intercepted.

The Plant Genetic Resources Project-An Indo-U.S. Priority

The Indo-U.S. Subcommission on Agriculture was established in 1979 by the India-United States Joint Commission on Economic, Commercial, Scientific, Technological, Education, and Cultural Cooperation. It is one of four subcommissions that implement bilateral programs in specific areas. The subcommissions are the major official channels for programs between the United States and India. The Agricultural Subcommission has met five times, alternating the meeting site between New Delhi and Washington, D.C. The Subcommission operates as a govement-to-government body. It is administrative in function and outlines guidelines for joint activities, resolves problems, approves priorities, and explores new areas for collaboration.

Maize land race diversity collected from North Western Himalaya.

Fourth and Fifth Sessions of the Subcommission on Agriculture recommended the strengthening of India's plant genetic resources systems as a priority area for joint collaboration. Responding to the subcommission's initiative, ICAR and USAID developed the Indo-U.S. Plant Genetic Resources Project (PGR). Through the project, NBPGR, other ICAR institutes, and state agricultural universities will be linked into a nationwide system to explore, evaluate, conserve, and utilize plant genetic resources.

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The total project cost is $21.66 million with USAID providing $13 million and the Government of India the rupee equivalent of $8.66 million. USAID grant funds will be used for short-term technical assistance, training, equipment, collaborative research, joint explorations, evaluation, and monitoring. Grant funds will also be used to partially fund the construction of a new national genebank building in New Delhi with a long-term storage capacity of 600,000 samples. Dr. N.S. Randhawa, ICAR Director General, stated that "the project will help India to preserve available germplasm for posterity and also for use by the scientists on a worldwide basis for crop-improvement research."

Goals of the Project

The project activities correspond to the main components of a plant genetic resources system (and NBPGR's divisions): (1) exploration and collection; (2) evaluation; (3) conservation; (4) documentation and data management; (5) quarantine; and, (6) exchange. When fully implemented the project will strengthen NBPGR and provide India with:

- a comprehensive inventory of nearly 121 working germplasm collections located throughout the country;
- a high quality germplasm collection for crop improvement research;
- a new NBPGR genebank for long-term storage (50-100 years) of up to 600,000 samples;
- joint germplasm exploration and collection programs;

- a computerized germplasm data base management system;
- plant quarantine stations with well-equipped screenhouses to facilitate exchange of germplasm; and
- new storage and laboratory facilities at selected regional stations.

In addition, NBPGR will play a lead role in developing and conducting regional and global plant genetic resource conferences, workshops and training programs. Linkages between the U.S. and Indian germplasm systems will be strengthened, particularly in the area of collaborative research and germplasm exchanges. The U.S. Department of Agriculture (USDA) will play a central role in this process by arranging technical assistance, training, collaborative research and joint exploration activities. USAID signed a Participating Agency Service Agreement (PASA) with USDA in February of this year. The underlying purpose of the PASA between USAID and USDA is to establish a long-term administrative and fiscal linkage for the implementation of the PGR Project. Through the project NBPGR will gain access to the network of U.S. federal institutes, state universities and private sector organizations which are part of or interact with USDA's National Plant Germplasm System. The first two Indian scientists to work with their USDA counterparts under the PASA will arrive in the United States in early summer of this year.

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