politicians, lawyers, judges, economists, custom officials, police and other relevant groups.

- Strengthen extension programmes on biodiversity issues for conservation professionals, NGOs and for those in public and private sectors.

- Promote networking of biodiversity extension/ training programmes with ongoing programmes in participatory forest management and tribal development.

- Develop a structured publicity programme for enhancing the awareness for biodiversity conservation through audio, visual and print media.

## 4.10 RESEARCH AND DEVELOPMENT ACTIVITIES

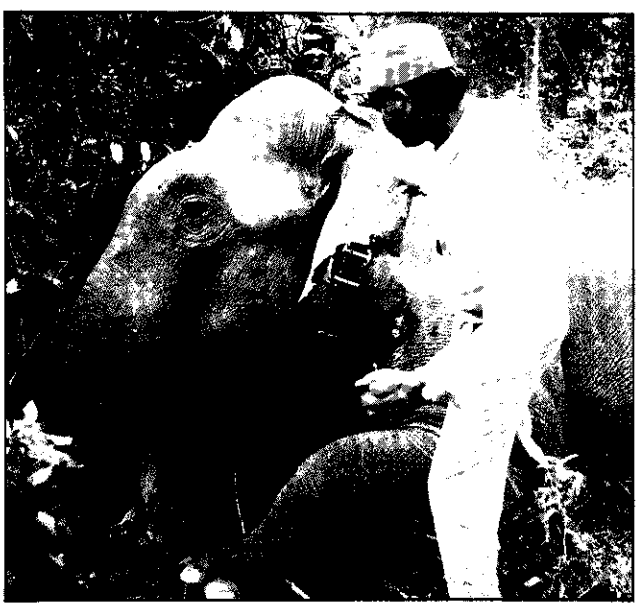
### 4.10.1 Current status

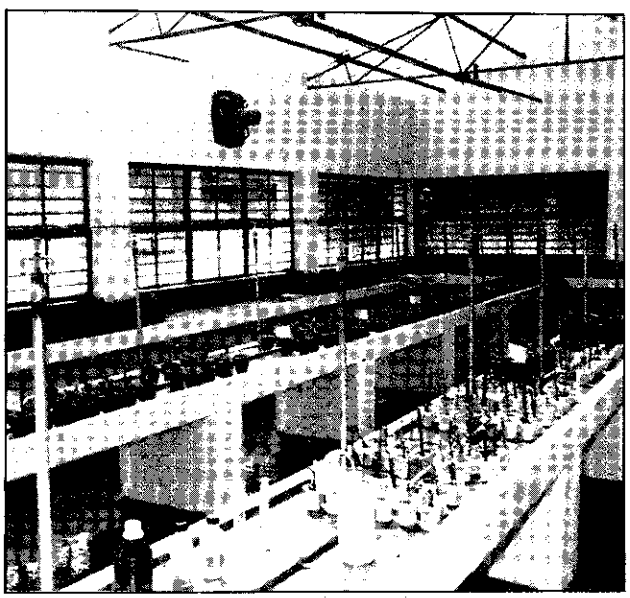
The Ministry of Environment and Forests, Department of Agricultural Research and Education, Department of Agricultural Cooperation, Department of Animal Husbandry and Dairying, Department of Science & Technology (DST), Department of Biotechnology (DBT), Department of Ocean Development, Department of Space, Department of Scientific and Industrial Research and Ministry of Health are the principal Departments/ Ministries which have R&D initiatives and support research activities related to biodiversity. Many of these Departments and Ministries have a host of subject-specific or goal-specific organisations. The organisations under Indian Council of Agricultural Research (ICAR), Council of Scientific & Industrial Research (CSIR) and Ministry of Environment and Forest are listed in Boxes 8, 9 and 10, respectively.

In semi-government sector, universities and deemed universities such as Indian Institutes of Technology, Indian Institutes of Management, Indian Institute of Science etc. are doing pioneering research work. Some of such research programmes are funded by the UGC, CSIR, DST, DBT, MOEF etc.

Some organisations under the State Governments, such as Kerala Forest Research Institute, and Tropical Botanic Garden and Research Institute, are undertaking R&D on biodiversity.

Some important NGOs engaged in research related to biodiversity are given in Box 11.





**Box 8 : R&D organisations under Indian Council of Agricultural Research (ICAR)**

1. Central Agricultural Research Institue, Port Blair
2. Central Arid Zone Research Institute, Jodhpur
3. Central Avian Research Institute, Izzatnagar
4. Central Inland Capture Fisheries Research Institute, Barrackpore
5. Central Institute for Cotton Research, Nagpur
6. Central Institute of Research on Buffaloes, Hissar
7. Central Institute for Research on Goats, Makhdoom
8. Central Institute of Agricultural Engineering, Bhopal
9. Central Institute of Brackishwater Aquaculture, Madras
10. Central Institute of Fisheries Education, Mumbai
11. Central Institute of Fisheries Technology, Kochi
12. Central Institute of Freshwater Aquaculture, Bhubaneswar
13. Central Institute of Horticulture for Northern Plains, Lucknow
14. Central Marine Fisheries Research Institute, Kochi
15. Central Plantation Crops Research Institute, Kasaragod
16. Central Potato Research Institute, Shimla
17. Central Research Institute for Dryland Agriculture, Hyderabad
18. Central Research Institute for Jute & Allied Fibres, Barrackpore
19. Central Rice Research Institute, Cuttack
20. Central Sheep & Wool Research Institute, Avikanagar
21. Central Tobacco Research Institute, Rajamundry
22. Central Tuber Crops Research Institute, Thiruvananthapuram
23. Cotton Technological Research Laboratory, Mumbai
24. Directorate of Oilseeds Research (ICAR), Hyderabad
25. Directorate of Pulses Research (ICAR), Kanpur
26. Directorate of Rice Research (ICAR), Hyderabad
27. ICAR Research Complex for North Eastern Hill Region, Shillong
28. Indian Agricultural Research Institute, New Delhi
29. Indian Grassland and Fodder Research Institute, Jhansi
30. Indian Institute of Horticultural Research, Sadashivnagar
31. Indian Institute of Sugarcane Research, Lucknow
32. Indian Lac Research Institute, Ranchi
33. Indian Veterinary Research Institute, Izzatnagar
34. National Academy of Agricultural Research Management, Hyderabad
35. National Bureau of Animal Genetic Resources, Karnal
36. National Bureau of Fish Genetic Resources, Lucknow
37. National Bureau of Plant Genetic Resources, New Delhi
38. National Centre for Mushroom Research and Training, Solan
39. National Dairy Research Institute, Karnal
40. National Research Centre for Citrus, Nagpur
41. National Research Centre for Groundnut, Junagadh
42. National Research Centre for Integrated Pest Management, Faridabad
43. National Research Centre for Mithun, Shillong
44. National Research Centre for Sorghum, Hyderabad
45. National Research Centre for Soyabean, Indore
46. National Research Centre for Spices, Calicut
47. National Research Centre on Camel, Bikaner
48. National Research Centre on Coldwater Fisheries, Haldwani
49. National Research Centre on Equines, Hissar
50. National Research Centre on Yak, Dirang
51. Sugarcane Breeding Institute, Coimbatore
52. Vivekananda Parvatiya Krishi Anusandhan Shala, Almora

**Box 9 : R&D Organisations under Council of Scientific and Industrial Research (CSIR)**

1. CSIR Centre for Biochemicals, Delhi
2. CSIR Complex, Palampur
3. Central Drug Research Institute, Lucknow
4. Central Food Technological Research Institute, Mysore
5. Central Fuel Research Institute, Dhanbad
6. Central Institute of Medicinal & Aromatic Plants, Lucknow
7. Central Salt and Marine Chemical Research Institute, Bhavnagar
8. Centre for Cellular and Molecular Biology, Hyderabad
9. Indian Institute of Chemical Biology, Jadavpur
10. Institute of Microbial Technology, Chandigarh
11. National Botanical Research Institute, Lucknow
12. National Environment Engineering Research Institute, Nagpur
13. National Institute of Oceanography, Goa
14. National Institute of Science, Technology and Development Studies, New Delhi
15. Regional Research Laboratory, Bhopal
16. Regional Research Laboratory, Bhubaneswar
17. Regional Research Laboratory, Jammu Tawi
18. Regional Research Laboratory, Jorhat
19. Regional Research Laboratory, Thiruvananthapuram

**Box 10 : Organisations of Ministry of Environment and Forests (MOEF) undertaking R&D**

1. Botanical Survey of India, Calcutta
2. Central Pollution Control Board, Delhi
3. Centre for Ecological Research and Training, Bangalore
4. Centre for Environment Education, Ahmedabad
5. Centre for Mining Environment, Dhanbad
6. Forest Survey of India, Dehradun
7. Govind Ballabh Pant Himalayan Paryavaran Vikas Sansthan, Kosi, Almora
8. Indian Council of Forestry Research & Education, Dehradun
9. Indian Institute of Forest Management, Bhopal
10. Indian Plywood Industries Research Institute, Bangalore
11. Institute of Arid Zone Forestry Research, Jodhpur
12. Institute of Deciduous Forests, Jabalpur
13. Institute of Forest Genetics & Tree Breeding, Coimbatore
14. Institute of Moist Deciduous Forests, Jorhat
15. Institute of Wood Science & Technology, Bangalore
16. National Museum of Natural History, New Delhi
17. National Zoological Park, New Delhi
18. Padmaja Naidu Himalayan Zoological Park, Darjeeling
19. Salim Ali Centre for Ornithology & Natural History, Coimbatore
20. Wildlife Institute of India, Dehradun
21. Zoological Survey of India, Calcutta

**Box : 11 : Some Non-governmental organisations engaged in research**

1. M. S. Swaminathan Research Foundation (MSSRF), Chennai
2. Foundation for Revitalisation of Health Traditions (FRLHT), Bangalore
3. World Wide Fund for Nature (WWF), India
4. SRISTI, Ahmedabad
5. Research Foundation for Science, Technology and Natural Resource Policy, New Delhi
6. Bombay Natural History Society, Mumbai
7. Kalpavriksha, New Delhi.

### 4.10.2 Gaps

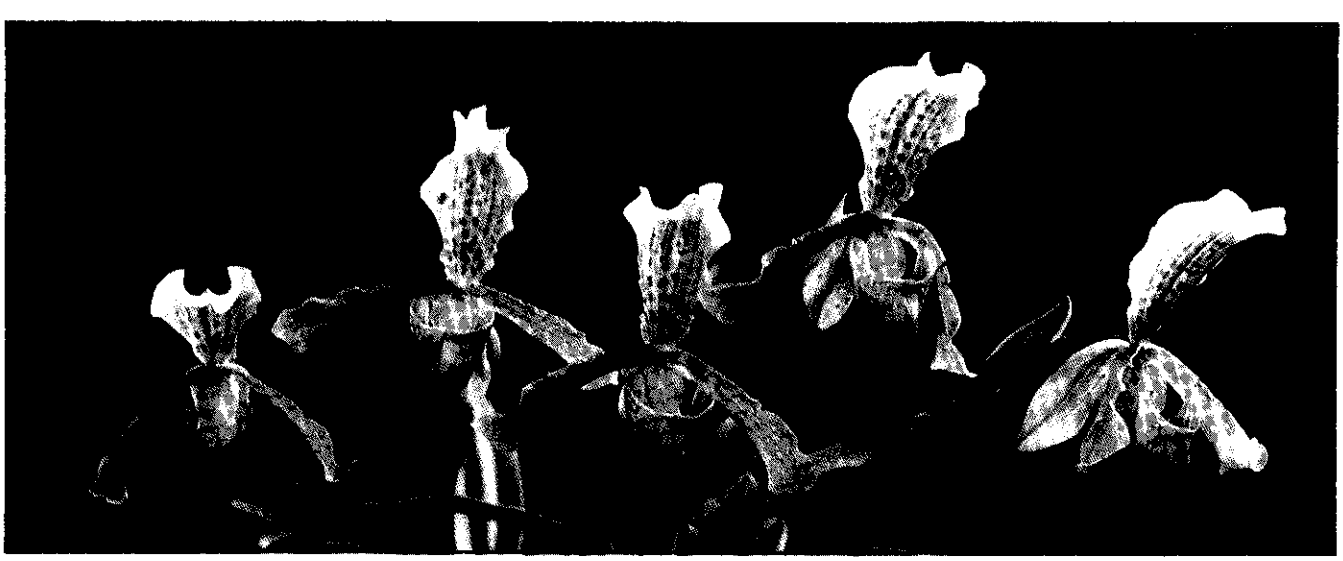
There is a lack of coordination among the various organisations undertaking research on biodiversity. Some ecosystems are well-studied, while others have not received similar attention. Likewise, research on species diversity is widespread, whereas genetic diversity has not been studied adequately. Further, as yet even the parameters for research activities are not well defined, at least in some cases. Even where the R&D parameters are well defined and sharply focussed, the studies take a long time to conclude. The findings of research projects take even longer to be integrated into policy making.

Some of the significant areas where there are major gaps in R&D are : bioprospecting, molecular characterisation and upgradation of technologies.

The participation of industry and other private sector in R&D is as yet not substantial.

### 4.10.3 Action points.

- Identify a coordinated agency for R&D work pertaining to biodiversity.
- Develop research plans on priority areas such as molecular characterisation, bioprospecting and upgradation of technologies.
- Devise mechanisms to fully gear up the participation of private sector in R&D activities.
- Promote research on evaluation of threats to biodiversity.
- Accord priority to research in hot spot areas for understanding the ecological principles for conserving the endemic species.



- Promote basic and applied research for different types of ecosystems and species, with special emphasis on hitherto unexplored/under explored areas and lesser known groups of plants and animals, e.g., lower groups.

- Encourage research on microrganisms with special reference to their role in various functional aspects of ecosystems such as energy flow, nutrient cycling, decomposition etc.

- Promote and strengthen infrastructure leading to development of techniques for sustainable use, including harvest or economically important components of biodiversity, e.g., wildlife ranching, horticulture propagation etc.

- Develop appropriate biotechnologies for utlisation of biodiversity components, which are ecologically sound and economically viable.

- Enhance research efforts on modified habitats such as agro-ecosystems, organic farming, use of biofertilisers and biopesticides and integrated pest management.

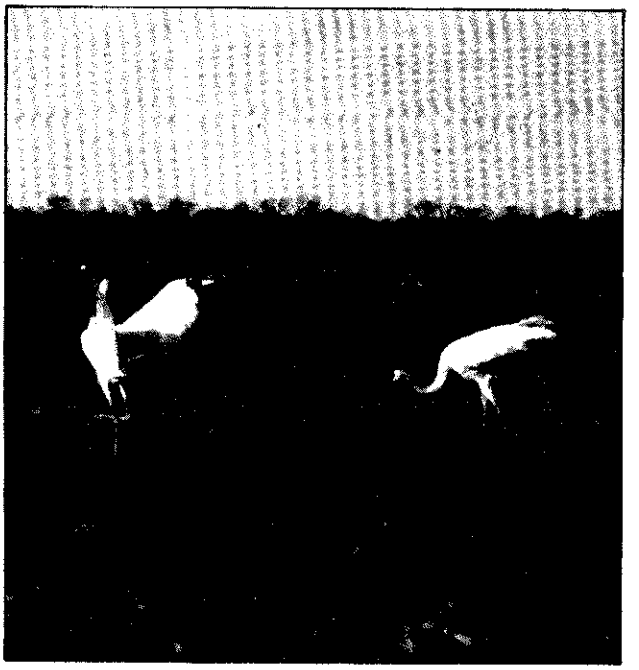
- Promote research on evaluation of impacts of developmental activities on components of biodiversity, and ecosystems as a whole.

- Set up regional centres of excellence of biosystematic studies on representative ecosystems to promote and pursue survey activities.

- Establish Centres of Excellence for taxonomic research in priority areas.

- Set up regional centres for microbiological research and centres to establish a microbial inventory for survey of bio-activity and future uses through publicity.

- Undertake periodic review of R&D activities.



## 4.11 INTERNATIONAL COOPERATION

### 4.11.1 Current status

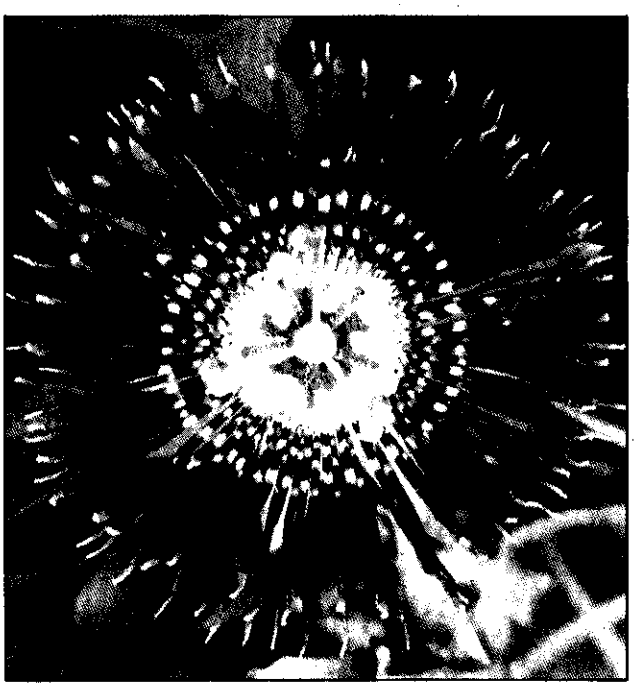
India is a Party to a number of multilateral environmental treaties. These are:

- Convention on Biological Diversity 1992.
- Convention on International Trade in Endangered Species of Wild Fauna and Flora 1973.
- Ramsar Convention on Wetlands of International Importance especially as Water Fowl Habitat 1971.
- Convention concerning the Protection of World Cultural and Natural Heritage 1972.
- Convention on Conservation of Migratory Species of Wild Animals 1979.
- Convention on Conservation of Antarctic Marine Living Resources. 1980.
- Convention on the Law of the Sea 1982.
- International Tropical Timber Agreement 1983.
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal 1989.

- Montreal Protocol on Substances that Deplete the Ozone Layer 1987.
- Framework Convention on Climate Change 1992.
- Convention on Desertification 1994

For steering and supervising the process of implementing the Convention on Biological Diversity, the Conference of the Parties (CoP) is the supreme decision making body. In order to provide the CoP with scientific, technical and technological advice, the Subsidiary Body for Scientific, Technical and Technological Advice (SBSTTA), was established. As per Article 20 of the Convention "the developed country Parties shall provide new and additional financial resources to enable developing country Parties to meet the agreed full incremental costs to them". At present, the Global Environment Facility (GEF) is the institutional structure on an interim basis for the financial mechanism of the Convention.

The Ministry of Environment and Forests in the Government of India cooperates actively on environmental issues with the United Nations Environment Programme (UNEP), United Nations Development Programme (UNDP), South Asia Cooperative Environment Programme (SACEP) and International Centre for Integrated Mountain Development (ICIMOD). India is also a State Member of the International Union for Conservation of Nature and Natural Resources (IUCN).



India is a member of the South Asian Association for Regional Cooperation (SAARC), which is the forum for promoting regional cooperation in this region. Technical discussions on environmental related matters are considered under the SAARC Technical Committee on Environment and Meteorology.

### 4.11.2 Gaps

Concerted efforts are required to improve bilateral and multilateral cooperation, as also cooperation with UN agencies and other international organisations on issues related to biodiversity. India shares a number of components of biodiversity with neighbouring countries, hence there is an urgent need to promote regional cooperation to evolve strategies for effective implementation of the provisions of the Convention, without undercutting each others interests.

### 4.11.3 Action points

- Further consolidate and strengthen global cooperation, especially with UN agencies and other international bodies on issues related to biodiversity.
- Promote regional cooperation especially with neighbouring countries through fora like SAARC, ASEAN, ESCAP etc. which share components of biodiversity across their boundaries for effective implementation of suitable strategies for conservation of biodiversity.
- Within the provisions of the Convention on Biological Diversity, promote bilateral cooperation leading to conservation and sustainable use of biodiversity.
- Develop programmes/projects for accessing funds for conservation and sustainable use of biodiversity from external funds for conservation through bilateral, regional and other multilateral channels.

## CHAPTER 5

The subject of biodiversity is cross-sectoral in nature. Besides, State Governments, local institutions and people play a major role in conserving and sustainably utilising biodiversity. Equitable sharing of benefits also require informed and vigilant action at all levels. Implementation of the action plan will therefore naturally be heavily dependent on the involvement of central sector ministries/departments and other organisations both Government and Non Government, research and development institutions, academic institutions for subjects and areas pertaining to them.

For implementation and monitoring of the Action plan, there shall be a supervisory committee under the chairmanship of the Secretary, Environment & Forests with the Inspector General of Forests, Secretaries of other concerned Central Ministries, representatives of State Environment and Forest Departments, NGOs and a few experts as members. Experts on specific subjects may be co-opted where required. Similar management arrangements shall be made at the State level.

All India coordinated projects on various themes and subjects, e.g., taxonomy, coastal and marine biodiversity, national data base, will be formulated and implemented to secure full utilisation of available infrastructure and funds with augmentation and further inputs and funds wherever the need is established. Sources of domestic as well as external funding will be explored and availed of.

# LIST OF PHOTOGRAPHS

FRONT COVER (Clockwise)
Upperhill Ecosystem
Coral
Thunia marshiliana Orchid
Mangrove Ecosystem
Bird – Chestnut headed Bee-eater
Royal Bengal Tiger
Endangered Pitcher Plant

SECOND COVER
A pair of open Bill Stork Chick at Kulik Bird Sanctuary, West Bengal

INSIDE PAGES (Sequence wise)
Neora Valley National Park
Chital Herd at Kanha National Park
Silk Worm
Basaka (Medicinal Plant)
Wild Elephant Herd, Garo Hills, Meghalaya
Flowering Jarul Tree (Lagerstromia Spp.)
Shola of Western Ghats
Peacock
Cobra Lily
Red Panda
Leopard Cat
Himalayan Fern
Median Egret
Fruit
Lion at Gir National Park
Great Indian Bustard
Coastal Ecosystem
Desert Ecosystem
Neora Valley National Park
Tropical Rain Forest
Dry Decidious Forest
Gujrat Saline Area with Babul Shrubs
Stilt Roots of Mangrove Eco-system
Wetland Eco-system at Kulik Bird Sanctuary, West Bengal.
Wetland of Rashikbeel Eco-Tourism Complex, North Bengal
Mangrove Ecosystem
Hental (Phoenix paludosa)
Coral
Desert Ecosystem
Sea Crab
Magnolia
Mugger Crocodile on river bank, Corbett National Park
Pangolin
Leather Back Sea Turtle
Soil Erosion
Plastic pollution and Bio-Diversity Degradation of Himalayas
Vateria metacarpa tree
Mangrove Degradation
Pair of Hoolock Gibbon
Pin tail
Brahma Kamal
Echinodermata
Ribbon Fish
Cinchona Tree
Sea Urchin
Coral
Red Fiddler Crab
Pitcher Plant
Elephant Herd in Corbett
Tiger in Water, Bandhavgarh Tiger Reserve
Rhino at Jaldapara Wildlife Sanctuary
Brow Antlered Deer, Kaibul Lamjao National Park, Manipur
Lizard
Tree Fern
Himalayan Monal, Singhalila National Park
Yellow Raspberry
Lion Tailed Macaque
Tissue Culture of Plant
Male Rhino in Zoo
Botanical Garden
Butterfly at Bhitarkanika
Cultivation of Oyster Mushroom
Cray Fish
Strobulus Flower
Bamboo Roofing -
Forest Nursery
Sea Grass
Glorisa superba (Glory Lily)
Himalayan Newt, Zorpukhri, Darjeeling
Forest Research Institute, Dehradun
Grass Hopper
Peltophorum pterocarpum(Radha Chura)
Black Partridge, Corbett National Park
Student at Exhibition
Teachers in Nature Trail
ZSI Publications
Adult Education at Mizoram
Radio Collaring of Elephant, Gorumara National Park
Plant Culture in Laboratory
Ladies Slipper Orchid
Siberian Crane at Bharatpur Bird Sanctuary, Rajasthan
Passion Fruit Flower
Ashoka

THIRD COVER
A colourful Kusum Tree

BACK COVER (Clockwise)
Coral Fish
Demoiselle Crane
Brow Antlered Deer
Marine Ecosystem
Spectacled Monkey
Legume Flower
Spider Weaving
King Cobra
Cochlospermum gossypium Flower

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