ADDENDUM TO THE BIODIVERSITY CONSERVATION IN SRI LANKA

A Framework for Action

CHAPTER REPORT - 15

RESEARCH, DEVELOPMENT AND TECHNOLOGY TRANSFER

Biodiversity Secretariat
Ministry of Environment

CHAPTER REPORT ON RESEARCH, DEVELOPMENT AND TECHNOLOGY TRANSFER

(TASK FORCE NO-14)

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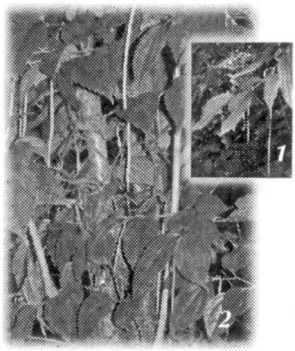

COVER PHOTO

Piper sylvestre
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1. BACKGROUND

The themes of research development and technology transfer are clearly elaborated in the Convention on Biological Diversity (CBD). Article 12 of the CBD highlights the need for research and training related to biodiversity conservation, while Articles 15 - 19 of the CBD highlights access to genetic resources, equitable use, benefit sharing, sharing of technology (including biotechnology), and international cooperation.

The role of research in biodiversity conservation could be elaborated under several themes.

- *Document the status of biodiversity:* Research is needed to document biodiversity in a country, at ecosystem, species and genetic level, and document changes and threats to biodiversity
- *Sustenance/Preservation of biodiversity:* Research is needed to find more effective ways of protecting valuable biodiversity, manage protected areas, sustain biodiversity outside protected areas in managed landscapes, address specific threats and their impacts, and to ensure greater biosafety
- *Restoration of biodiversity:* Research is needed to find out methods to restore biodiversity in degraded areas, and also to document practical and cost effective methods to recover populations of endangered species, including ex-situ activities
- *Sustainable use of biodiversity:* Research is needed to discover and develop innovative uses of biodiversity, enhance the benefits from those uses, and make them more sustainable
- *Reduce/mitigate impacts related to exploitation of biodiversity:* Research is needed to reduce waste and damage in harvesting systems, including reduced-impact logging, inland and marine fishery, non-timber forest products and ecologically sustainable agricultural systems

- *Reduce/mitigate impacts related to development:* Research is needed to plan and implement measures to reduce/mitigate impacts on biodiversity related to specific development activities
- *Valuation of biodiversity:* Research is needed to document the value of biodiversity in terms of products, direct and indirect services, in order to convince planners and policy makers to develop conservation policies and promote necessary investments to implement conservation action

Therefore, a national biodiversity conservation action plan should elaborate on mechanisms to establish and maintain programmes for scientific and technical education and training for the identification, conservation and sustainable use of biodiversity and also to promote and encourage research which contributes to conservation and sustainable use of biodiversity.

The 1999 Biodiversity Conservation Framework for Action has identified some issues related to research on biodiversity and proposed recommendations for action to address the issues (Section 6.7 of the MOFE, 1999). Research recommendations have also been made under other sectors, in the same document (Sections 6.1-6.6, 6.9, 6.11, 6.12). Apart from the 1999 BCAP, the significance and need to promote biodiversity research has also been identified and recommended in other recent national documents. These include the state of the environment of Sri Lanka (MOFE, 2001), and caring for the environment 2003-2007 – a path to sustainable development (MOENR, 2003). The Central Environmental Authority took an initiative in 2000 to prioritize environmental research needs in Sri Lanka, including research on biodiversity (CEA, 2001).

A careful review of the 1999 Biodiversity Conservation Framework for Action enabled to identify several gaps related to research development and technology transfer. Therefore, this addendum is intended to elaborate on gaps of the above document, identify constraints that hinder research development and technology transfer, prioritize research on biodiversity conservation and recommend actions to address the gaps, constraints and implement prioritized research.

2. GENERAL CONSTRAINTS/BARRIERS THAT HINDER RESEARCH DEVELOPMENT AND TECHNOLOGY TRANSFER PERTAINING TO BIODIVERSITY CONSERVATION

- Inadequate funding
- Lack of infra-structural facilities
- Dearth of quality students with initiative, creativity and independent thinking to pursue in biodiversity oriented research, due to lack of employment opportunities
- Dearth of experienced senior researchers (including taxonomists) in institutions dealing with biodiversity and related fields (also related to 'brain drain')
- Inadequate training opportunities or refresher courses to enhance knowledge and capacity of researchers
- Inadequate mechanisms to recognize, appreciate and reward researchers for their significant findings, in order to encourage them
- Lack of opportunities for highly qualified, trained researchers
- The research programmes of relevant government departments lagging behind or abandoned
- Beauraucracy of some government departments
- Inadequate dialogue/links between biodiversity researchers and the private sector (ie., industrialists and exporters who exploit biodiversity for commercial purposes) and between the university researchers and other research institutes, including government conservation departments
- The poor status of national repositories does not encourage foreign/local taxonomists to work with them and deposit type specimens
- Lack of a mechanism for local researchers to establish

collaborative research links with researchers attached to foreign institutions

- Capacity building using information gathered from research is lacking (filtering of information to the next generation is inadequate, the work usually ends up in a research paper, information does not get down to the teaching level, nor to the end user such as farmers, industrialists etc.)
- Inadequate access to information and technology related to biodiversity conservation (ie., type specimens lodged in foreign museums, molecular biological techniques and advances in biotechnology, inability of researchers to access research published in international journals/symposia)
- The policy makers/granting bodies fail to understand the end users and applications of biodiversity oriented research.

3. GAPS IN THE 1999 BCAP IN RELATION TO RESEARCH DEVELOPMENT AND TECHNOLOGY TRANSFER PERTAINING TO BIODIVERSITY CONSERVATION

- Absence of a comprehensive section on applied research priorities on documenting/understanding Sri Lanka's biodiversity (species and genetic diversity), its conservation needs and sustainable use of biodiversity
- Inadequate attention on conducting research on threats to biodiversity (ie., spread of invasive alien species, pollution related to misuse of agro-chemicals, over-exploitation), and developing relevant technology to mitigate such threats
- Lack of an institutional framework to coordinate applied/ practical research work pertaining to biodiversity conservation, and also to channel/manage funding for such work
- Lack of an institutional mechanism to collate existing research data for the purpose of access
- Inadequate focus on developing the capacity and infrastructure pertaining to taxonomy

- Inadequate emphasis on identifying constraints that hinder research development and technology transfer related to biodiversity conservation, and remedial measures to address such constraints
- Lack of a clear strategy to communicate/transfer research findings/technology into policy and action by relevant agencies, and also to share the knowledge with end users/practitioners
- Lack of a mechanism to facilitate the development of regional and international co-operation in technical and scientific issues relating to biodiversity

4. STRATEGIES AND RECOMMENDATIONS FOR RESEARCH DEVELOPMENT AND TECHNOLOGY TRANSFER RELATED TO BIODIVERSITY CONSERVATION

I. DOCUMENTING/UNDERSTANDING SRI LANKA'S BIODIVERSITY

Issues:

Although the angiosperms and vertebrate species of Sri Lanka are relatively well documented, there is a clear dearth of information on the lower plants and invertebrates. Compared to the taxonomy of higher plants, vertebrates such as mammals, birds and reptiles, and invertebrates such as butterflies have not been revised for several decades. The distribution of species is inadequately documented. Information on the genetic diversity of wild species populations is scarce. The ecological role of many species has not been understood adequately, and interdisciplinary studies on biology are scarce. The soil biodiversity is least studied.

Specific constraints/barriers for research:

- Inadequate capacity for taxonomic research/dearth of trained taxonomists

- Poor status of the national repository on fauna (the Natural History Museum), and faunal collections in institutions scattered across the island
- Lack of infrastructure for molecular techniques that facilitate taxonomy
- Inadequate funding for taxonomic research

Recommendations for action:

- Upgrade the status of the National Museum of Natural History, conduct a revision of the type specimens currently deposited, scan and digitize the collections, and establish links with all other national institutions, and private research agencies/NGOs that harbour curated faunal collections
- Upgrade the status of the National Herbarium, scan and digitize types specimens
- Develop the capacity of the other relevant institutions for biodiversity-related research (including field research and education centers) and information management
- Establish collaborative links with foreign museums, research institutions and promote links with foreign taxonomists for collaborative research
- Enhancing the capacity of curators attached to the National Herbarium and Natural History Museum through training under foreign/local experts
- Initiate a comprehensive national revision of all vertebrates and un-revised invertebrate groups
- Promote interdisciplinary research that focus on plant-animal interactions

Main Institutions responsible for implementation:

National Museum of Natural History, National Herbarium, the Biology Departments of National Universities, Private Institutions/NGOs involved in taxonomy/biodiversity research.

II. SUSTENANCE OF BIODIVERSITY WITHIN THE CONTEXT OF INCREASING ALLOCATION OF LAND AND WATER RESOURCES TO A GROWING HUMAN POPULATION.

Issues:

The population density of Sri Lanka has been increasingly steadily over the past few decades. In the biodiversity-rich wet zone of Sri Lanka, the human population density is nearly 600 individuals/km2, and the near-primary forest cover is less than 5%, occurring in several fragments. The increasing human population continues to exert a tremendous pressure on existing land and water resources, in order to meet their demands/requirements. The river water is subjected to diversion and/or regulation, for irrigated agriculture and hydropower generation projects. Although a significant portion of the island is protected (total protected area coverage is about 30% of Sri Lanka, under the purview of the Department of Wildlife Conservation and the Forest Department), biodiversity continues to be degraded/depleted, while several rare/ endangered species occur outside protected areas.

Specific constraints/barriers for research:

- Conservation biologists pay inadequate attention to the biodiversity in managed landscapes
- Inadequate capacity/collaboration for a wider landscape oriented research for biodiversity conservation
- Inadequate capacity for environmental flows analysis
- Conflicting theories/areas of focus among line agencies

Recommendations for action:

- Initiate an island-wide survey on biodiversity in managed landscapes, including home gardens, urban areas and agricultural systems
- Establishment and maintenance of habitat mosaics in agricultural landscapes, and integrate with organic farming practices
- Establishment and maintenance of urban biodiversity refuges

(ie., avenue plantations, parks, ponds, canals, cemeteries with tree cover, Arboreta, river bank reservations, road reservations etc.)

- Improve the capacity of relevant government agencies on environmental flows analysis through training and initiate research to determine environmental flows pertaining to major river basins in Sri Lanka
- Initiate research on methods to link natural landscapes and increase connectivity between protected areas and managed landscapes

Main Institutions responsible for implementation:

Agriculture Department, Urban Development Authority, the Biology and Agriculture Departments of National Universities, Mahaweli Authority, Irrigation Department, RRI, TRI, CRI, Department of Export Agriculture, NARA, CCD, Road Development Authority.

III. POPULATION RECOVERY OF ENDANGERED SPECIES

Issues

According to the 1999 list of nationally threatened species, 48% (306 spp.) of the evaluated invertebrates, 42% (253 spp.) of the vertebrates, and 85% (690 spp.) of the evaluated flowering plant species are threatened in Sri Lanka. However, active research and programmes to recover the populations of threatened species are yet to be initiated.

Specific constraints/barriers for research:

- Legal constraints pertaining to ex-situ conservation programmes
- Funding
- Lack of infrastructure
- Lack of capacity and knowledge for ex-situ conservation

Recommendations for action:

- Initiate research on ex -situ culture/captive breeding of selected species for reintroduction in to wild habitats, including a programme to monitor the progress of re-introduced species
- Document habitats of rare/threatened species that occur outside protected areas, and initiate a community based conservation and monitoring programme on such species
- Initiate research on inbreeding and out breeding depression, targeting endangered species

Main Institutions responsible for implementation:

Royal Botanic Gardens, the Biology Departments of National Universities, Department of Wildlife Conservation, Forest Department, National Zoological Gardens, Private Institutions/NGOs involved in conservation.

IV. RESTORATION, ENRICHMENT AND ENHANCEMENT OF DEGRADED ECOSYSTEMS

Issues

Many forests in Sri Lanka have been degraded due to logging activities and chena cultivation. Similarly, many wetlands are also degraded due to pollution and reclamation.

Specific constraints/barriers for research:

- Funding
- Lack of knowledge and capacity

Recommendations for action

- Identify priority areas for restoration
- Research on habitat enrichment using indigenous species
- Implement pilot restoration activities in selected areas using existing knowledge on restoration with indigenous species

Main Institutions responsible for implementation:

Royal Botanic Gardens, the Biology and Agricultural Departments of National Universities, Department of Wildlife Conservation, Forest Department, Private Institutions/NGOs involved in conservation.

V. MITIGATION OF BIODIVERSITY IMPACTS RELATED TO DEVELOPMENT

Issues

Urbanization, industrial development and agricultural expansion has resulted in the loss of natural habitats, qualitative degradation of aquatic and terrestrial habitats due to pollution, spread of invasive alien species and contribute towards climate change, all of which are causing many negative impacts on native biodiversity.

Specific constraints/barriers for research:

- Inadequate technology
- Lack of cooperation from the industrial sector towards research on environmentally friendly technology

Recommendations for action:

- Promote research on environmentally friendly technology, including waste/effluent treatment
- Provide incentives for the industrial sector for investing on research for development of environment friendly technology, and adopting such technology in their industrial operations
- Initiate an island-wide survey on invasive alien species and their ecological and economic impacts, in order to prioritize them for management
- Research on methods to control the spread of prioritized invasive alien species
- Initiate research on impacts of climate change on biodiversity in terrestrial and wetland ecosystems, using indicator taxa

- Initiate a monitoring programme to document the changes/ impacts of recent floods and landslides
- Promote research on developing renewable energy sources such as wind power, dendro-power, solar power and sea wave energy
- Initiate research on development of home-garden based fuel wood plantations and commercial fuel wood plantations to promote dendro-power
- Promote research on enhancing energy efficiency in urban areas (ie., construction of energy efficient buildings)

Main Institutions responsible for implementation:

Ministry of Industrial Development, BOI, ITI, Agriculture Department, National Aquatic Resources Agency, Biology and Agriculture Faculties of National Universities, Department of Wildlife Conservation, Forest Department, Ministry of Power and Energy

VI. CONSERVATION OF AGRICULTURAL BIODIVERSITY, INCLUDING TRADITIONAL VARIETIES

Issues

Although Sri Lanka harboured many species/varieties of traditional food crops (including traditional cereals, yams/tubers, vegetables, spices and fruits), most of them have already been lost, or become rare. The germplasm of useful agricultural plants have not been adequately preserved. The traditional knowledge pertaining to indigenous food varieties is diminishing rapidly. In general, there is a vacuum in relation to agro-biodiversity research in Sri Lanka. Over-use of agri-chemicals (biocides and chemical fertilizers) has led to the disappearance of many useful native bio-control organisms, and depletion of useful soil fauna.

Specific constraints/barriers for research:

- Lack of provincial level Infra-structural facilities to store crop germplasm

- Lack of incentives/motivation for agricultural researchers to indulge in conservation-oriented research
- Inadequate capacity for conservation oriented agricultural research
- Absence of a proper land use policy for agriculture
- Politics related to transfer of knowledge gained by research to policy and end users (the farmers)

Recommendations for action:

- Develop research on finding techniques to conserve wild relatives of domesticated plants and farm animals for the sustenance of agro-biodiversity
- Initiate research on documenting traditional indigenous food plant varieties
- Establish provincial level gene banks to store the germplasm of traditional food varieties (cereals, yams/tubers, vegetables, spices and fruits)
- Promote research on native bio-control agents of agricultural pests, and ways to breed and release them into specific agricultural systems
- Initiate research to document traditional knowledge related to agriculture
- Develop techniques to blend traditional agricultural knowledge with new technology
- Promote research on organic farming
- Document traditional hybrids of farm animals
- Initiate targeted research towards improving the efficiency of irrigation water use for agriculture (ie., drip irrigation, micro irrigation)
- Initiate research on ecotoxicology to document the impacts and bioaccumulation of pesticides

Main Institutions responsible for implementation:

Agriculture Department, Agriculture Faculties of National Universities, Department of Animal Husbandry

VII. PROMOTING SUSTAINABLE USE OF BIODIVERSITY

Issues

At present, many species of plants and animals in Sri Lanka are over-exploited mainly from wild habitats for commercial purposes, resulting in decline of wild populations. These include medicinal plants, ornamental plants (ie., orchids and aquatic plants) and animals (ie., fresh water fish). Most of the species exported for ornamental purposes fail to receive a fair price in the international market due to inadequate quality control and value addition. However, if these species could be exploited in a sustainable manner, with mechanisms in place for quality control and value addition, it could generate a considerable amount of foreign revenue to the country.

Specific constraints/barriers for research:

- Lack of commitment of the private sector to invest on research
- Inadequate technology

Recommendations for action:

- Provide incentives/subsidies for the private sector to invest on research that focus on sustainable extraction of species
- Develop research and technological advances pertaining to ex-situ propagation/breeding of commercially valuable plants and animals (ie., tissue-culture of ornamental plants)
- Establish district level medicinal plant arboreta
- Provide technology and incentives for out-growers to cultivate/ breed ornamental plants and ornamental fish for export trade

- Initiate research on ecophysiological requirements of non-timber as well as timber species of commercial value, and establish and maintain long-term demonstration plots/research trials (long term) to generate knowledge that could be put into practice
- Promote research on cultivation of native fibre crops (ie., Jute)
- Research on low-impact tourism focusing on natural landscapes
- Encourage the private sector to invest on forest plantations in degraded land for timber and fuel wood, and expand research on sylviculture
- Initiate research on value addition and quality control related to species subjected to export
- Promote research on inland and marine (near-shore and off-shore) fishery to estimate fish stocks and ensure sustainable harvesting
- Identify alternative 'eco-friendly' income generating cottage industries and agro industries, and develop their transport and marketing systems

Main Institutions responsible for implementation:

Agriculture Department, National Aquatic Resources Agency, Department of Fisheries and Ocean Resources, Agriculture Faculties of National Universities, Export Development Board, ITI, Department of Ayurvedic Medicine, Ministry of Industrial Development.

VIII. BIOTECHNOLOGY AND BIOSAFETY.

Biotechnology is gaining rapid momentum today, due to its ability to produce organisms that promote agriculture and other benefits related to medicine. The import of genetically modified organisms is a matter of great concern, due to their potential negative impacts on native biodiversity, including indigenous crops.

Recommendations for action:

- Initiate research to document impacts of genetically modified organisms on biodiversity
- Initiate research to establish and maintain means to regulate, manage or control the risks associated with use of biotechnology

Main Institutions responsible for implementation:

Agriculture Department, Biology and Agriculture Faculties of National Universities

IX. VALUATION OF BIODIVERSITY

Issues

Undervaluation of biodiversity is a serious issue in Sri Lanka. Although the value of biodiversity products are understood by the public, the value of ecosystem services that natural ecosystems provide (e.g. providing clean air and water, climate regulation, nutrient recycling) has yet to find wide appreciation in the country. The negative implications of this aspect are clearly visible at the policy level, where planners and policy makers are reluctant to promote necessary investments to implement conservation action.

Specific constraints/barriers for research:

- Inadequate capacity on Environmental Economics

Recommendations for action:

- Promote applied research on valuation of biodiversity in wetland and forest ecosystems, biodiversity parks and habitat linkages
- Promote awareness of the value of biodiversity to policy makers

Main Institutions responsible for implementation:

Agriculture Department, Biology and Agriculture Faculties of National Universities, Post-graduate Institutions, Department of National Planning

X. PRESERVATION OF INDIGENOUS KNOWLEDGE PERTAINING TO BIODIVERSITY CONSERVATION

Issues

The local communities of Sri Lanka possessed a rich traditional knowledge pertaining to biodiversity, its sustainable use and conservation gathered through their interactions with nature. However, this knowledge, which was passed down through generations and preserved, is now being depleted rapidly, mainly due to inadequate use.

Specific constraints/barriers for research:

- Lack of interest among biological researchers to document traditional knowledge
- Lack of quality control, adultration etc.

Recommendations for action:

- Promote sociological research to document traditional knowledge related to different aspects of biodiversity in Sri Lanka
- Promote opportunities for village level committees to put their knowledge into use, through sale of value added products in conservation areas, and also practice traditional in-situ/ex-situ methods

Main Institutions responsible for implementation:

The Sociology and Agriculture Departments of National Universities, Department of Ayurvedic medicine

5. SPECIAL ISSUES AND RECOMMENDATIONS

Special Issue 1

Lack of an institutional framework to coordinate applied/practical research work pertaining to biodiversity conservation, and also to channel/manage funding for such work.

Action

The National Science Foundation should establish a formal mechanism with the Biodiversity Secretariat of the Ministry of Environment and Natural Resources, to coordinate applied/ practical research work pertaining to biodiversity conservation, and also to channel/manage funding for such work.

Special Issue 2

Lack of an institutional mechanism to collate existing research data for the purpose of access.

Action

A Meta Data Base should be established in the Biodiversity Secretariat, with links to other data sources scattered in government departments, NGO's and Universities, with proper guidelines pertaining to the access and use of relevant data.

Special Issue 3

Lack of a clear strategy to communicate/transfer research findings/ technology into policy and action by relevant agencies, and also to share the knowledge with end users/practitioners.

Action

A legally recognized (cabinet approved) committee should be established under the biodiversity secretariat to deal with the above issue.

Special Issue 4

Lack of a mechanism to facilitate the development of regional and international co-operation in technical and scientific issues relating to biodiversity.

Action

The National Science Foundation should consider above issue as part of their mandate, and establish a separate unit to develop suitable regional and international cooperation to address technical and scientific issues relating to biodiversity.

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