
SCIENCE NEWS

IX INTERNATIONAL SYMPOSIUM ON TROPICAL ECOLOGY MAJOR CONCLUSIONS AND FUTURE OUTLOOK

The IX International Symposium on Tropical Ecology, including the International Conference on Rehabilitation of Disturbed Ecosystems: A Global Issue, organized by the International Society for Tropical Ecology, was held at Swatantrata Bhawan, Banaras Hindu University during 11–16 December 1987. The academic meets were attended by 450 delegates including about 100 from abroad representing 25 countries. Besides 15 sessions devoted to contributed papers, 5 day-long sessions devoted to poster presentation, and 4 plenary lectures, the symposium included 17 special sessions, each organized by a leading expert in the field. The special sessions were devoted to: Wildlife conservation; Nutrient cycling in tropics; Human dimensions in the management of tropical ecosystems; Agroecosystems; Tropical soil biology and fertility; Air quality and plants; Biogeography; Plant population ecology; Tropical ecology in understanding global changes; Tropical marine ecosystems; Mangrove ecosystems, and Freshwater ecology. The special sessions of rehabilitation conference included: Policy concepts and strategies; Policy formulation and implementation; Rehabilitation of grassland ecosystems; Rehabilitation of forest ecosystems; Rehabilitation of aquatic/wetland ecosystems, and Rehabilitation of ecosystems: A synthesis. Through presentations and discussions in open-forums the following consensus and recommendations have emerged:

1. The multitude of tropical terrestrial, freshwater and marine ecosystems are vital to the maintenance of global environment quality and stability. However, long term inter-disciplinary quantitative studies on the structure, functioning, utilization and management of different ecosystems are extremely scarce. Coordinated site-specific, Long-term *sustained* ecosystem research programmes need be taken up urgently for major ecosystem types such as humid forests, dry forests, semi-arid and arid savannas/grasslands, mountain forests, coastal ecosystem, etc. throughout the tropics. These studies supplemented with the required gamut of process studies should provide the much needed strong data base encompassing the year-to-year variability and long term changes of fluxes in ecological processes and state variables.
2. As a consequence of increasing pressure of human activities most tropical ecosystems, ranging from marine to alpine Himalaya are showing signs of stress and a reduction in biological productivity and diversity. The problems related with the maintenance of ecological balance have assumed levels of crisis in several areas. These problems often transcend local perspectives; for example, deforestation in Himalaya has serious repercussions in the Gangetic Plains and the Bay of Bengal.
3. Disturbances in tropical ecosystems are bound to have global environmental repercussions, largely of unknown nature; for instance, the likely effect of tropical deforestation on global temperature rise through increase in carbon dioxide concentration in the atmosphere, a possibility with disastrous consequences for the earth system. The forthcoming International-Geosphere and Biosphere programme of the International Council of Scientific Unions is of much relevance and there is a need of establishing a chain of permanent research sites or Geosphere-Biosphere observatories in different tropical areas. These observatories should monitor the environmental changes and may conduct long-term ecosystem level experiments for assessing the impact of environmental changes on the life-support system. It is essential to develop scientific methodology for predicting environmental changes at various scales viz. regional and global.
4. There is an urgent need for documentation and quantification of biological diversity, and the degree of resource degradation. For instance, accurate estimates of rates of deforestation and its economic, social and ecological impacts are urgently called for. Production of biogenic gases such as methane, NO_x , etc. need to be estimated and studied in different natural and man-impacted ecosystems, as they may have important feed-back effects on global change.
5. Soil, a valuable but eroding resource in tropics, needs concentrated efforts to better understand its biology and chemistry and the basis of its fertility, under natural and cultivated conditions in different climatic zones. Rational biological practices for maintenance and improvement of soil fertility are essential for sustained productivity on long term basis. Further, there is a need to consider and study

agriculture as an ecological system rather than as a production system only.

6. The marine and coastal ecosystems, especially the euphotic zone and estuaries, have great potential for biological productivity; their conservation needs and their role in global biogeochemical cycling should be better understood, and interactions amongst land, oceans and atmosphere need be quantified.

7. The role of wildlife in tropical ecosystems is poorly understood. Wildlife observation, quantification, monitoring and conservation should be promoted, especially through greater involvement of university research programmes.

8. The rural and tribal populations in the tropics, having traditionally a wide resource base, have shared for ages an intimate relationship with fauna and flora. It is necessary to understand the human dimensions — social, economic, political and religious — of man-nature interactions, for evolving strategies for effective management and conservation of tropical ecosystems. In ecological appraisals and in search for solutions to environmental problems man must be included as a natural and manipulative component.

9. Management programmes should consider landscapes as holistic concrete systems, with ecological and geographical entities, so as to effectively cope with the closely interwoven natural and cultural heterogeneity in space and time. There is a need to study the ecological processes and the dynamics of various ecological components at landscape (e.g. watershed) level.

10. Rehabilitation of the disturbed ecosystems, rather than their restoration, appears to be a rational theme in consonance with development without destruction. Clearly, there is a need to evolve, test and refine appropriate ecotechnology to ensure repair, maintenance and conservation of diverse ecosystems. For example, reconstruction of critical food webs and nutrient flows are now considered essential components of ecologically-sound rehabi-

litation techniques. Changes during natural and man-managed rehabilitation need be documented to provide for a rich experience base. Policy concepts and strategies should accommodate the landscape processes in successful ecosystem rehabilitation.

11. While decision-makers often have to respond quickly to an environmental crisis, the scientists call for time to research the problems to suggest viable long-term solution. Mechanisms must, therefore, be found to bridge the time-gap between the two divergent but essentially complementary processes.

12. When symptoms of environmental degradation have become obvious, generally the choice for only curative solutions remains available. Therefore, there is an urgent need to develop predictive capacity to anticipate environmental problems well in advance of the crisis signals, so that preventive measures can be applied.

13. Politicians, economists, sociologists, ecologists and media men should work together to educate the public with the short and long-term ecological, economic and social consequences of both present and contemplated actions. The importance of people's participation in ecologically sustainable development, and use and conservation of natural resources, should be understood and promoted.

14. Nature ecology is an inter-disciplinary science and there is a need for developing university level inter-disciplinary curricula and research programmes to produce well-trained resource and environment managers with solid ecological background. For this purpose centres of excellence in Tropical Ecology need to be established. Several distinguished participants advocated that Banaras Hindu University is an appropriate Institution for establishing such a centre.

J. S. SINGH
K. P. SINGH
R. S. AMBASII

Department of Botany,
Banaras Hindu University,
Varanasi 221 005.

FIRST ASIAN CONFERENCE ON MYCORRHIZAE (I ACOM)
(University of Madras, January 29 to 31, 1988)

Asia has the largest arid zone. Its forest wealth is dwindling at an alarming rate. The mycorrhizae represent one of the nature's best gifts to mankind in reclaiming waste-land, in afforestation and in the conversion of arid soil to fertile and productive soil. Mycorrhizal research in Asia is relatively recent, compared to Europe and North America. Even though research on mycorrhizae was initiated in other countries immediately after Frank's (1885) classic report, surprisingly in India, mycorrhizal research did not get under way until the early fifties. Chauduri (1945) was the first to report on the mycorrhizal association in *Abies spectabilis*, *Cedrus deodara*, *Picea morina*, *Pinus roxburghii* and *Taxus baccata*. We owe a great deal to Dr Bakshi of the Forest Research Institute who made sustained research on mycorrhizae. Substantial amount of research work has been carried out in India on the taxonomical aspects of mycorrhizal fungi, ecology and field experiments.

In China there was hardly any research on mycorrhizae until the fifties. A few institutions started research on mycorrhizae since the mid 1950's. Besides strengthening the research on taxonomy of ectomycorrhizal and VA mycorrhizal fungi and research on the preparation of mycorrhizal inocula, in recent years, research was initiated in China on mass production of mycorrhizal fungi and mycorrhizal inoculation of tissue culture plantlets. The mycorrhizal research has been started only in the late seventies in Bangladesh, Nepal, Sri Lanka, Singapore, Thailand, Malaysia and Indonesia.

Whereas the western countries have pooled their resources on mycorrhizal technology, Asian countries are yet to launch any major action programme. It is relevant to mention that North American Conference on Mycorrhizae (NACOM) and European Conference on Mycorrhizae (ECOM) have become great focal points of exchange of information. These bodies despite language and political barriers meet once in two/three years. These conferences have directly benefited the participating countries in developing action plan for agro-forestry, afforestation and waste-land reclamation.

Since the problems are common in Asia, the experience and exchange of views by scientists from the Asian countries will have direct impact on Forestry and Agriculture. This was taken up seriously and the scientists in the Centre for Advanced Studies in Botany, University of Madras, under the

leadership of Prof. A. Mahadevan made the dreams of many Asian Scientists into reality with the financial support from the University of Madras, UGC, CSIR, DST, INSA, Department of Bio-Technology, Third World Science Academy (Trieste, Italy), COSTED, International Development Research Centre, Canada and International Foundation for Science, Stockholm. The conference was attended by leading scientists, not only from Asia but also from USA, UK and Canada. Mycorrhizologists from Sri Lanka (3), Bangladesh (1), Nepal (2), China (4), Malaysia (3), Thailand (3), Indonesia (3), Korea (2), Vietnam (1), USA (4), UK (1), Canada (1) and 100 from India attended the conference. The conference was inaugurated by Prof. G. Rangaswami, the former Vice-Chancellor of Tamil Nadu Agricultural University and a renowned Microbiologist of the country.

Apart from the plenary session, there were 6 sessions. The first session was on the 'Status of mycorrhizal research in Asian Countries' and Dr D. H. Marx, Director, Institute for Mycorrhizal Research and Development, Georgia, USA chaired the session. The second session was 'Taxonomy and ecology of mycorrhizae' and was chaired by Dr P. A. Mason, Institute of Terrestrial Ecology, Scotland. The session 'Plant growth and physiology of mycorrhizae' with Dr R. K. Dixon, from Auburn University, USA as Chairman was devoted to the latest developments on mycorrhizal physiology. Prof. S. Hadi, University of Mulawarman, Indonesia, chaired the fourth session 'Mycorrhizae in crop improvement'. 'Mycorrhizae for forestry' was chaired by Dr J. M. Trappe, Oregon State University, USA. Prof. Kuo Shiu Chien from The Chinese Academy of Forestry, China chaired the session, 'Production of mass inoculum and biotechnology of mycorrhizae'. The plenary session was chaired by Mr A. Karim Oka, Programme Officer for Forestry, International Development Research Centre, Ottawa, Canada and he also delivered the valedictory address. During the valedictory session Prof. K. G. Mukerji of Delhi University welcomed the gathering and Prof. A. Mahadevan proposed a vote of thanks. The Chinese delegation extended an invitation to hold the 2nd ACOM in China. To achieve a "Green Asia" the following areas of research have been identified: (i) Survey of mycorrhizal fungi in Asia and their taxonomy; (ii) Ecology, physiology and biochemistry of mycorrhizal

fungi; (iii) Morphology and structure of mycorrhizal associations, with particular attention to ultra-structure; (iv) Culturing of endomycorrhizal fungi; (v) Mass culture of mycorrhizal fungi in fermenter; (vi) Mandatory treatment of nursery seedlings with mycorrhizal fungi; (vii) Suitable genetic engineering techniques are to be used to evolve promising mycorrhizal fungi, and (viii) A data bank and a mycorrhizal fungal culture centre may be estab-

lished for the benefit of the participating countries.

A. MAHADEVAN
K. NATARAJAN
N. RAMAN

Centre for Advanced Studies in Botany,
University of Madras,
Madras 600 025.

REGIONAL (SOUTH ASIAN) SEMINAR CUM WORKSHOP ON 'DATA STORAGE, RETRIEVAL AND DISSEMINATION IN SCIENCE, WITH SPECIAL REFERENCE TO CHEMICAL AND MOLECULAR BIOSCIENCES' — MADRAS 18-23 JANUARY 1988

The above programme lasting for a week was organized by NICRYS at the Department of Crystallography and Biophysics, University of Madras. The main focus in the programme was modern computerized databases particularly the non-bibliographic hard data variety, selected in the area of chemical and molecular biosciences. There were 15 specialists speakers from USA, UK, Europe and India and about 100 delegates mostly from India and the surrounding countries like Bangladesh, Malaysia, Thailand, etc.

The lecture programme and talks were conducted mostly in the forenoons while demonstrations were held in the afternoons and evenings. Structural crystallography formed a major component. The organic crystal structural data (Cambridge Structural data, CSD), Inorganic crystal structural data (ICSD), Powder diffraction data and the NBS-crystal data formed the major items. In addition to the crystallographic data the mass spectroscopic data and the Beilstein chemical data were also covered. In the molecular biosciences area, the protein structural and sequence data and the nucleic acid sequence data (Genbank) were covered. Molecular graphic displays of nucleic acids and proteins were demonstrated using NEXUS 3000 Graphic Workstation. The nucleic acid sequence data analysis using a PC/AT system with data on a CD-ROM (Optical disk) unit was a notable feature.

Among other things the development of the software for handling the CSD data using dbase III for PC/AT system by NICRYS needs special mention.

There were specialists speakers from USA, UK and Europe. They were Dr D. G. Watson, Cambridge Crystallographic Data Centre, Cambridge, UK; Dr G. W. A. Milne, National Institute of

Health, USA; Dr Ron Jenkins, Joint Committee on Powder Diffraction Standard, USA; Dr Stephen Heller, Agriculture Research Service, USA; Prof. F. Blattner, University of Wisconsin, Wisconsin; Mr. Richard Feldman, National Institute of Health, USA; Prof. G. Bergerhoff, Institute of Anorg Chemi, der Universitat Bonn, West Germany, and Dr Rold Sievers, Institute of Anorg Chemi, der Universitat Bonn, West Germany. Besides, on specific databases, there were representative groups from India who presented results of operation on some of the databases, more specifically CSD operated by NICRYS at Madras. They were Dr T. N. Guru Row, National Chemical Laboratory, Pune; Dr S. Ramakumar, Indian Institute of Science, Bangalore; Prof. C. Ramakrishnan, Indian Institute of Science, Bangalore; Dr V. S. Jakkal, Bhabha Atomic Research Centre, Bombay; Dr G. R. Desiraju, University of Hyderabad, Hyderabad; Prof. R. Srinivasan, University of Madras, Madras; Prof. N. Yathindra, University of Madras, Prof. A. S. Kolaskar, University of Pune, Pune, and Dr J. Vijayalakshmi, NICRYS, University of Madras, Madras.

Because of physical constraints, the number of participants was restricted to about 50. But an equal number attended the lectures and talks. It is gratifying to note that most of the experts had readily responded to the request of the organizers and made available generously "Course material".

R. SRINIVASAN
Department of Crystallography and Biophysics,
University of Madras,
Madras 600 025.