



Indigenous Knowledge Systems and Biodiversity Management



Proceedings of a MacArthur Foundation
ICIMOD Seminar

April 13-15, 1994, Kathmandu, Nepal

Contents

**Indigenous Knowledge Systems
and
Biodiversity Management**

Foreword iii

Introduction v

Meeting of MacArthur Foundation Grants 1

ICIMOD Seminar on Indigenous Knowledge Systems and
Biodiversity Management 27

Planning Studies 45

Appendices 51

1. Participants' List 55

2. Agenda 57

3. MacArthur Foundation Project Sites 63

International Centre for Integrated Mountain Development

Editor

Jeannette D. Gurung

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Indigenous Knowledge Systems
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Views of the Himalayas — B. R. Bhatta

[Inset] *Women from Himachal selling hemp, a minor forest product, in a bazaar town*
— T. Partap.

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In the preparation of this report, an attempt has been made to reflect the views and interpretations expressed by the participants at the workshop. These views and interpretations are not attributable to the International Centre for Integrated Mountain Development (ICIMOD), and do not imply the expression of an opinion concerning the legal status of any country, city, or area of its authorities, or concerning the delimitation of its frontiers or boundaries.

Foreword

Contents

The Hondo-Kash Himalayan Region is one of the world's richest ecosystems in terms of biodiversity. This is due to the extreme altitudinal variations with concurrent changes in temperature and precipitation, and differences in soil conditions, which have combined to create a striking vertical zonation in the natural vegetation.

Foreword	iii
Introduction	v
Meeting of MacArthur Foundation Grantees	1
ICIMOD Seminar on Indigenous Knowledge Systems and Biodiversity Management	23
Planning Session	45

Appendices	51
1. Participants' List	52
2. Agenda	57
3. MacArthur Grantees' Project Sites	59
4. Parks and Protected Areas in the HKH	60

This joint meeting of ICIMOD and the MacArthur Foundation provided participants with a valuable opportunity to learn of initiatives to enhance biodiversity management in the Eastern Himalayas and in Southeast Asia, and to share thoughts on ways to further promote these objectives in the future. In view of the shared concerns of the six states, Himalayan countries, and the invaluable actions undertaken in some of them, the participants at the seminar expressed a keen interest in the establishment of collaborative arrangements between institutions, organizations, and individuals working in the field of biodiversity research and management. ICIMOD is committed to facilitating exactly these kinds of exchange in the coming years.

Foreword

The Hindu-Kush Himalayan Region is one of the world's richest ecosystems in terms of biodiversity. This is due to the extreme altitudinal variations with concurrent changes in temperature and precipitation, and differences in soil conditions, which have combined to create a striking vertical zonation in the natural vegetation.

Biodiversity is a function of both natural and social systems; its utilisation and conservation involve interactions between species, populations, communities, landscape, and natural ecosystems, on the one hand, and culture, technology, indigenous knowledge, and commercialisation on the other. The HKH Region is characterised by diverse ethnic groups which have developed their own cultures based on available natural resources, giving rise to a cultural diversity on par with the high level of biological diversity found in the region. The essential and long-standing relationships that humans have with these resources embrace cultural identity, spirituality, and subsistence practices that sustain communities and frequently contribute to the maintenance of biodiversity.

The necessity of involving inhabitants of areas within and bordering protected areas in processes of biodiversity management is now being recognised by governments and international conservation organisations. The HKH Region is fortunate to have within its borders a few examples of protected areas where conservation efforts have been made compatible with the socioeconomic interests of local people. Such areas can provide a valuable learning tool for others to visit and learn from.

This joint meeting of ICIMOD and the MacArthur Foundation provided participants with a valuable opportunity to learn of initiatives to enhance biodiversity management in the Eastern Himalayas and in Southeast Asia, and to share thoughts on ways to further promote these objectives in the future. In view of the shared concerns of the eastern Himalayan countries, and the innovative actions undertaken in some of them, the participants at the seminar expressed a keen interest in the establishment of collaborative arrangements between institutions, organisations, and individuals working in the field of biodiversity research and management. ICIMOD is committed to facilitating exactly these kinds of exchange in the coming years.

ICIMOD is grateful to the World Environment and Resources' Programme of the MacArthur Foundation for making possible this meeting of professionals involved in the management of biodiversity from the Himalayan region and beyond. Specifically, we would like to offer our thanks to Kuswata Kartawinata and Dan Martin for their suggestions, and flexible and generous support for this seminar and for their support to the ICIMOD biodiversity project being implemented over the last three years in eastern Nepal and Yunnan, China. This workshop has created an environment for future collaboration on indigenous knowledge on biodiversity management in the HKH. I am looking forward to further in-depth analyses and field-level applications for the benefit of present and future generations.

Egbert Pelinck
Director-General

Introduction

The Vajra Hotel at the base of the sacred Buddhist stupa of Swayambhu in Kathmandu, Nepal, was the site of a series of meetings sponsored by the MacArthur Foundation, U.S.A., and the International Centre for Integrated Mountain Development (ICIMOD). The meetings took place from April 13 - 15, 1994. Twenty grantees of the MacArthur Foundation's Eastern Himalayan Programme also shared their experiences and reviewed issues and options for conservation and development needs in the region which is identified as one of the world's "hotspots" - in most urgent need of conservation action in view of its rich yet quickly disappearing plant and animal diversity. This was also the site of a seminar on "Indigenous Knowledge Systems and Biodiversity Management," sponsored by ICIMOD and the MacArthur Foundation. A planning session on the promotion of Trans-boundary and Inter-country Conservation Programmes was the third component of this international consultation.

Over 50 participants from Bhutan, China, France, India, Indonesia, Nepal, the Philippines, Sri Lanka, Thailand, the U.S., and UNESCO, representing government agencies, universities, research institutes, and NGOs, convened to discuss issues related to people's participation in natural resource conservation and management.

Through grants from the MacArthur Foundation, 20 organisations and individuals reviewed the specific conservation problems their countries face in light of their development needs. Through an interactive process, the basis was laid for discussion on the role of indigenous knowledge in the maintenance of biodiversity.

Members of the collaborating organisations of an ICIMOD project on "Promotion of Agroforestry/Forest Management through Local Organisations in the Eastern Himalayas" presented the results of their two years' field work in Sankhuwasabha District, Nepal, and in Yunnan Province, China. In this action research project, SAGUN, a Nepali NGO, and the Kunming Institute of Botany collected indigenous knowledge of resource management from the communities inhabiting national parks and protected areas. The research should be useful to park managers for understanding the needs and resources of the area and the effect of park policies on people, so as to bring about park-people policies and relationships that are mutually beneficial.

Introduction

The cultural beliefs and practices which form the basis of these communities' worldviews and affect their land-use decisions and resource management practices have been a significant part of the research. As part of the programme, training and small-scale technical inputs were introduced to improve, but not replace, traditional systems and local organisations strengthened to sustain project initiatives beyond the three-year project duration.

The gathering of this assortment of experts provided a unique opportunity to address conservation issues from an ecoregional perspective in which ecological, not national, boundaries are of foremost importance. The scope for trans-boundary and regional conservation programmes was further explored during the planning sessions. A field visit to ICIMOD's demonstration and training site at Godavari concluded the three-day event.

Introduction

Dr. Dan Martin, Director of the World Environment and Resources' Programme of the MacArthur Foundation, opened the meeting by stating its objectives.

The objectives were:

i) to identify developments that had occurred recently, e.g., advances in sustainable development and conservation;

ii) to find ways to support each other - explore new opportunities and set global-biological priorities, e.g., Eastern Himalayan ecosystems; and

iii) to talk about a new set of grants

The loss of biodiversity is immediate and acute; the loss is permanent and has a direct effect on the lives of the poorest people. This is the reason for the MacArthur Foundation's in-

The loss of biodiversity is immediate and acute; the loss is permanent and has a direct effect on the lives of the poorest people.

volvement in biodiversity conservation efforts, Dr. Dan Martin told grantees. *"It is crucial to identify the areas experiencing loss of biodiversity and those rich in biodiversity."* Due to the uneven distribution of biodiversity in the north, the Board had decided to focus on critical areas in the south such as the Andean mountains, the Indonesian forests, Brazil, the Eastern Himalayas, and the Western Ghats. *"These resources are global treasures",* Dr. Martin said; *"hence their protection is a global responsibility."*

Concluding Dr. Martin said that it was vital to support the efforts of those working for their preservation. Unlike most donors, the MacArthur Foundation favours an ecological approach

that sees the "interconnectedness" between various elements.

Dr. Kartawinata, a senior programme officer from the MacArthur Foundation, announced the agenda and nominated the chairmen for each country session.

■ Bhutan

Speaking from the chair, Mr. Mingma Sherpa, representative of WWF Bhutan, introduced Mr. Tshewang Wangchuk, from the Bhutan Department of Forests, and Mr. Kunsang Yonten, Secretary-general of the Royal Society for the Protection of Nature (RSPN). A slide show accompanied Mr. Wangchuk's presentation.

Bhutan has a range of ecological zones, from tropical (south) to high mountains (north), and is thus blessed with rich biodiversity. It is predominantly an agrarian society based on natural resources, utilising traditional methods of resource management that have evolved over time. The Bhutan Forest Act was passed in 1969; by 1983 the Government had gazetted several Protected Areas' Systems (PAS) covering a total area of 9,505 sq.km. or about 20 per cent of the country. The PAS previously classified were not representative of all the eco-forest types; some were unsuitably big or small. With the inception of the Nature Conservation Section (NCS) of the Forestry Services' Division, the PA system was revised to address these shortcomings, and the total protected area increased to 22 per cent of the country.

Support from the MacArthur Foundation had been crucial in the formation of the NCS, Mr. Wangchuk said. The NCS activities include documentation of species in three national parks - Jigme Dorji, Black Mountains, and Royal Manas - which will facilitate the

formulation of management plans by 1997 for government approval and implementation. The proposal for Integrated Conservation and Development in Jigme Dorji could serve as a model for application in other PAS. So far emphasis had been placed on institutional-capacity building.

A separate Geographic Information Systems' (GIS) unit is to be set up in 1994. In addition, the Field Research and Nature Study Centre, currently under construction in the Black Mountains, is expected to function by 1995. The establishment of the Bhutan Trust Fund (BTF) for environmental conservation, with the collaboration of WWF, UNDP, and the Royal Government of Bhutan (RGOB), is expected to promote biodiversity conservation. Already the Fund has organised short-term training courses.

The Royal Society for the Protection of Nature (RSPN) was established in 1985, the first non-government organisation to deal with environment and allied concerns, said Mr. Yonten. Its principal objective is to promote conservation, manage natural resources, and raise public awareness on environmental issues.

In its initial phase the RSPN, with a staff of two and without external funding, devoted full attention to monitoring and protecting rare and endangered species, particularly the Black-necked Crane, and also in lobbying on environmental issues.

In August 1990, with WWF funding, the RSPN set up a permanent office and expanded its functions. The MacArthur Foundation became a donor in 1992, enabling RSPN to discard its watchdog role and to increase its activities.

(a) The basic objective of the RSPN has been a *priori* to heighten public awareness on environmental issues through educational programmes,

campaigns, publications, etc. RSPN has identified eight categories of programmes. Its focus, however, is on environmental education publications, lobbying, and ecotourism. The organisation has three units - audiovisual, environmental education, and general administration and management. In 1993/1994, RSPN will increase its biannual reports to six publications per year.

(b) Since public awareness programmes have so far mainly targeted school children and the literate population, RSPN identifies non-formal education as a future priority for the largely illiterate population. No public funding or support has come in for RSPN yet. The reasons for this are, first, that geo-political factors ensured that the kingdom maintained its ecological balance, so environmental issues are less urgent; and second, that a majority of the population are illiterate and unaware of the environmental repercussions of development. Thus, the still-evolving RSPN must continue to depend on external funding for its programmes and for its survival, making self-sustainability a long-term goal.

(c) Since most donors prefer to support specific projects, MacArthur funding is sought for institutional support.

■ WWF Bhutan and Nepal Programmes

Mr. Mingma Sherpa said that training, institutional support, and the inclusion of social forestry in the Bhutan Forestry Institute curriculum for trainers had been made possible because of MacArthur support. It had enabled staff to obtain technical training abroad and had helped develop curricula in various institutions such as the Bhutan Forestry Institute and Sherubtse College.

Mr. Sherpa said that MacArthur's

'seed' money to the Bhutan Trust Fund had made it possible for them to develop project proposals, widen their donor base, and organise field programmes.

A major development of the WWF Bhutan and Nepal Programmes was the establishment of field offices in both countries. These offices have enabled WWF to play a critical role in several important conservation initiatives, including the founding of the model Bhutan Trust Fund for Environmental Conservation. The field offices have developed the institutional capacity to supervise and support WWF activities in Bhutan and Nepal, and they have greatly improved WWF's effectiveness in providing technical assistance to conservation projects in these countries. They have made it possible to directly implement and supervise WWF activities and have improved the efficiency of WWF programme coordination in the Himalayan region.

The WWF Nepal and Bhutan Country Programmes have developed a long-term plan to work with NGOs and government agencies to conserve biodiversity. Developing and managing priority protected areas, as well as capacity building through education and awareness activities, will be continued. To this end, external funding will be important to WWF and conservation partners.

Discussion

The participants began by raising three points: that Eastern Himalayan temperate forests are intact forests, making their preservation a priority; that training should be a high priority; and that management plans should be formulated for three important areas.

Responding to a question, a Bhutanese discussant said that the importance of local species and their use

is illustrated in Thimphu hospital's traditional wing being bigger than the 'modern' wing. High priority is given to the collection and incorporation of local knowledge in projects and education, which is considered a two-way process between extension agents and the villagers.

He said a Citizens' Report on the State of the Environment is being published by RSPN. Students were conducting a survey on people's perceptions of the environment, and people from different institutes would be involved in the information exchange.

Noting that the Indian forest area, adjoining the Royal Manas Park in Bhutan, has been designated as a World Heritage Site, a UNESCO delegate asked what steps Bhutan had taken to ratify the UNESCO Convention. He said there were conflicting reports from India regarding the area and mentioned UNESCO's interest in sending a mission.

A discussant affirmed that WWF maintained contact with the Manas Park administrators. Although the conflict in Assam had created a management and protection problem, the Bhutanese and Indian sides were working it out together. He said Bhutan was working towards ratifying the convention.

Mr. Samar Singh said the principal issue was protection, especially of the tiger. He told participants that a National Biodiversity Alliance had been created by the Indian President, which included NGOs, media, and government officials, and that the Manas area topped the list of priority areas.

Mr. Yonten said the RSPN membership drive had begun and technical support was being provided by the Forest and Education departments among others. Nature guide books had been published and nature clubs established.

Responding to a question about protected and unprotected areas, a Bhutanese discussant said that 60 per cent of Bhutan has forest cover, 22.85 per cent of which includes protected areas that have human settlements. Besides these protected areas, forests have been designated for watershed protection and household and community use (where tree felling is open for limited extraction of resources).

■ Sri Lanka

Dr. S. K. Bawa, of the University of Massachusetts and Tata Energy Research Institute, New Delhi, chaired the meeting in which programmes in Sri Lanka and India were discussed.

Dr. C.V.S. Gunatilleke of the University of Peradeniya spoke about her research at the Sinharaja World Heritage Site.

The rain forests of Sri Lanka, spread over 15,000 sq.km. of the country and inhabited by 57 per cent of its population, are a relic of the Deccan Gondwanic flora and, therefore, of considerable biogeographic importance to the South Asian region. Ninety per cent of the endemic angiosperm flora in Sri Lanka are also concentrated in these forests. High species' occurrence and point endemism depict nine of the 15 distinctive floristic zones in the country as being exclusive to the small area. Over 50 per cent of the country's endemic flora are found in such forests.

The overall objective of the research in Sinharaja, the largest protected reserve in the wet lowlands, is to provide information useful for biodiversity conservation as well as for sustainable production of forest resources. Initiated in 1977 and funded by various organisations, including recently the MacArthur Foundation, the

research has expanded from an initial floristic inventory to an integrated multidisciplinary programme. The main facets of the research are given below:

Silvicultural Research

a) Seedling studies of selected canopy dominant species (i) in controlled shelters under varied moisture and light regimes and (ii) across natural forest gaps to identify the best micro-environment for establishment of each species. Competition among seven canopy dominant *Shorea* species is also being studied in other natural gaps of the forest.

b) Enrichment planting strip cuts in Caribbean pine plantations in the buffer zone. This trial of natural forest timber and non-timber species, as well as export agricultural crops and exotic timber species, will provide information on how monocultures may be converted to forests of multispecies' production or restored to ecosystems rich in species.

c) Long-term forest dynamic studies in the undisturbed forest. All plants more than one centimetre in diameter at breast height in a 25 ha plot are tagged, identified, and mapped to monitor the long-term changes of all the species within it. This information base will be invaluable in understanding (i) the micro-site specificity of species, (ii) differences in the performance of species in a similar logged forest nearby that will be established in the future, and (iii) plant diversity changes in silvicultural systems to be developed for production forests using knowledge accrued from seedling studies.

d) Vegetative and reproductive phenology of 10 canopy *Shorea* species, each represented by 30 trees, have been recorded weekly since 1985 to

examine their responses to long-term changes in climate.

Conservation Education

Programme : Based on research experiences, conservation education programmes have been conducted for officials of the Forest Department, university students as part of their ecology courses, local guides, and even foreign visitors. The publication, "A Guide to the Common Trees and Shrubs of Sri Lanka", is nearing completion.

Future plans include continuing the existing programme, encouraging village participation in *ex situ* cultivation of Non-Timber Forest Products (NTFP) in home gardens and buffer zones, integrating the latter with ecotourism, and conducting research on suitable silvicultural systems for the rain forests of Sri Lanka that serve multiple roles of production, gene pool conservation, education, and recreation.

■ **India**

Dr. R. Sukumar of the Centre for Ecological Science at the Institute of Science, Bangalore, said the Centre has been conducting a variety of basic applied and action-oriented research on biodiversity in the Western Ghats in south India. In recent years, there has been an increasing trend to study the entire spectrum of biodiversity of plants and animals, focussing, however, on elements of special human concern such as plant cultivars and medicinal plants. Under the MacArthur funded programme, these shifting priorities had been taken into account. The Centre initiated the following activities in the Western Ghats, focussing on the Nilgiri Biosphere Reserve.

1. Studies of plant-diversity in different ecological zones and habitats. This work involves basic inventories of plant taxa and longer term

studies of forest dynamics in permanent vegetation plots. Plots have been set up in two zones - the deciduous forests of the Western Ghats and the montane evergreen forests of the upper Nilgiris. Apart from the angiosperms, the Centre also intends to look at levels of diversity of lower plant groups such as pteridophytes, bryophytes, lichens, and fungi. These permanent plots are sites for monitoring several animal groups.

2. The wild relatives of cultivated plants and plant cultivars are being studied in the north Kanara district of Karnataka.

3. Diversity of soil micro-organisms, in particular the cellular slime moulds and the diversity of social insect groups, will be monitored in the permanent plots in both the deciduous and evergreen forests of the Nilgiris.

4. Diversity of vertebrates (amphibians, reptiles, and mammals) are being studied in the montane evergreen forests and grasslands. This will later be extended to cover their habitats in the Western Ghats, perhaps with the inclusion of birds.

In addition, the Centre will conduct an Asian School of Conservation Biology in Bangalore in August 1995. Researchers, students, and administrators from several Asian countries are expected to attend. Apart from biological issues relating to biodiversity conservation, policy issues are to be addressed. Grant funds will enable the Centre to set up its own field station to strengthen its field infrastructure in the Nilgiri Biosphere Reserve.

Mr. B. V. Shetty, of Mangalore University, delivered a presentation on the Western Ghats of Karnataka, with special reference to conservation of flora and fauna and plant lore.

An arboretum was established on the Mangalore University campus in an area of 1.8 ha. Of the 133 species

of trees and 189 species of shrubs and climbers endemic to the Western Ghats of Karnataka, seedlings/propagules of 45 species of trees, 19 species of shrubs and climbers, and eight endemic species of herbs have been introduced in the arboretum.

Vegetation studies/floristic surveys of both the forests and grasslands have resulted in the collection of 730 field numbers of specimens. Of the 300 identified, 47 species are from the grasslands. From satellite imagery and aerial photographs, forests of different classes are being identified and quadrat studies initiated to assess their structure and diversity. The Land-use pattern in the township of this mining area has been recorded and will be compared to the land-use pattern before mining operations began to assess the impact of mining and related activities on the area's vegetation.

Studies of the difference between mycoflora of iron-rich and non iron-rich areas have been conducted to identify strains of fungi that may serve as bio-monitors of heavy metals. Another subject of study is litter decomposition in some selected plant species in iron-rich and non iron-rich areas to assess the differences in the rate of decomposition. Research on iron-rich soils, with particular reference to their variation and distinction - depending on the host species - will be conducted to identify the species suitable for afforestation programmes.

Of the five species of chelonians in the Western Ghats, *Lissemys punctata* (flapshell turkey), *Trionyx leithii* (softshell turtle), *Melanocheilus trijuga* (black pond turtle), *Indotestuda forstenii* (Travancore tortoise), and *Geoemyda silvatica* (cane turtle), the stream-dwelling black pond turtle was selected for study by the capture-recapture technique, employing a novel trapping device standardised in our laboratory. Re-

sults indicate that there are 23 animals per km of the stream with a sex ratio of 2:8 (male:female); these are active at night, feeding mostly on carcasses and detritus, and rest during the day. Currently, attempts are being made to increase the sample size of the black pond turtle so that the data can be analysed by means of a specific computer software and so that radio telemetry can be used for the study of Travancore tortoise and cane turtle, twin species that are endemic and endangered.

Ethnobotanical Studies: Ethnobotanical studies were carried out on the Siddi and Gowli tribes of Uttara Kannada district and on the Koraga and Melekudiya of Dakshina Kannada district. A total of 108 plant species emerged as ethnobotanically useful from Uttara Kannada district, of which 96 plants are of medicinal importance. The curative property of two orchids, *Bulbophyllum neigherrense* and *Malaxis densiflora*, and the antifertility property of *Calamus thwaitesii* were recorded for the first time. In addition, 51 new medicinal uses were recorded for 43 known medicinal plants. Another noteworthy finding of the study was the use of *Vitex negundo*, *Ludwigia perennis*, and *Phyllanthus emblica* as pesticides and insect repellents. Ethnobotanical studies in South Kanara district revealed the various uses of about 307 plant species, of which about 230 species were medicinal. The abortifacient property of *Sapindus laurifolius* and *Entada pursaetha* were recorded for the first time.

Chairman Dr. K.S. Bawa said that the Western Ghats and the Eastern Himalayas in India are the "hot spots" of biodiversity. Conservation of biota in the two regions, as in much of South Asia, is hampered by a lack of information about (a) the rate of deforestation and degradation of habi-

tats, (b) the relative abundance and distribution of keystone species, (c) the effect of collection of timber and non-timber forest products on forest dynamics, (d) the socioeconomic determinants of forest resource use by indigenous communities as well as by government and non-government agencies, and (e) the regional land-use patterns.

Other impediments to effective conservation include inadequate measures for identifying and addressing the rural requirements of biomass, primarily fuelwood and fodder, and the shortage of human resources to resolve critical issues of biodiversity conservation and sustained use of forest resources.

Referring to the findings of research to address the above issues, Dr. Bawa told participants that the public awareness of the importance of biodiversity and the need to conserve the biota had increased in the preceding three years. During the same time, however, pressures on protected areas, including reserve forests, had intensified. The government agencies recognise that (a) rural needs of biomass must be addressed, (b) prudent use of biodiversity can contribute to the economic betterment of rural people, and (c) local communities should engage in conserving and managing biodiversity.

In concluding, Dr. Bawa said there are opportunities to take new initiatives in biodiversity preservation in South Asia as a result of increased public awareness of the value of biodiversity, the enhanced commitment of government and non-government agencies to conserve biodiversity, and conceptual and methodological advances in conservation biology, including approaches towards the valuation of biodiversity.

A joint presentation by Mr. Thomas Mathew and Mr. Samar Singh followed on WWF India's Biodiversity "Hotspots" Conservation Programme (BHCP). In July 1992, after a year of developing proposals and planning, WWF INDIA initiated the Biodiversity "Hotspots" Conservation Programme (BHCP) as part of its overall Biodiversity Programme.

The Programme attempts to provide a specific focus on two biodiversity rich zones of the Indian subcontinent - the Eastern Himalayas and the Western Ghats. WWF India's Biodiversity Programme brings together several subprogrammes in the following areas.

1. Wetlands
2. Conservation Information (Indira Gandhi Conservation Monitoring Centre)
3. Community Biodiversity Conservation
4. Protected Areas/Project Tiger
5. Conservation Manpower (Conservation Corps' Programme)
6. Illegal trade in endangered species of flora and fauna (TRAFFIC INDIA)

The BHCP provides a comprehensive biodiversity conservation focus, involving elements of every subprogramme mentioned above, on the key biogeographic regions (the Eastern Himalayas and Western Ghats) listed among the world's top 12 or so megadiversity "hotspots."

Used in relation to biodiversity the term "hotspot" has been the source of confusion and controversy. It originally designated major biogeographic regions rich in biodiversity but under threat from anthropocentric causes (development projects, shifting cultivation, logging, poaching, etc). The term is now somewhat loosely used to represent even smaller areas (e.g., sanctuaries under threat) that need concerted attention.

Taken further, advocates of a "landscape ecology" approach point out that a focus on local biodiversity "hotspots" is inadequate to take into account all the natural and man-induced relationships and influences that determine the biodiversity status of a particular region. It is not possible to conserve a local "hotspot" away from the influences exerted by elements in the landscape 'matrix'.

This is a valid argument and a more scientific approach. The term "hotspot" could still be used to indicate areas requiring priority attention. In addition to the two global "hotspots" under consideration, the Steering Committee for BHCP talked of the need to identify other "hotspots" in India.

BHCP Philosophy and Approach

WWF India's approach to the BHCP is built on the recognition of:

a) its position as a leading, influential conservation NGO interacting closely with a network of NGOs, scientific institutions, and official bodies, and

b) the existing programme and initiatives in biodiversity conservation in the two regions executed by a range of official and non-official bodies.

BHCP seeks to strengthen existing priority efforts in the field, in research on policy analysis and campaigning, and in education and legal support aimed at biodiversity conservation in the Eastern Himalayas and the Western Ghats. BHCP's approach in the Western Ghats differs markedly from that in the Eastern Himalayas. The Western Ghats have a significantly wider range of programmes and 'schemes' underway, aimed at conserving *in situ* and *ex situ* the biodiversity of the region, than do the Eastern Himalayas. There are few conservation

NGOs in the Eastern Himalayan region where Forest Departments and State Governments need far greater support from the BHCP than they do in the Western Ghats.

The first step taken in each zone is to scientifically delineate the area under reckoning. While practical and strategic considerations occasionally necessitate a focus on issues and areas outside these biogeographic zones (e.g., Army Biodiversity Conservation Programme), a key BHCP objective is to maintain its area focus in order to try and make a tangible impact on biodiversity conservation within it.

The Planning and Implementation Framework

In its preparatory phase, the BHCP team considered alternative frameworks in which the programme could develop and the thematic and geographical priorities could be selected. In line with the status of WWF INDIA as an NGO with a decentralised structural network, as well as a network of partner NGOs and institutions, BHCP adopted the strategy of providing broad support to and, where appropriate, influencing the priorities of its programme partners in biodiversity conservation. BHCP's main activities in the two biogeographic regions fall under these broad headings.

1. Strengthening the protected area network
 2. Conservation of biodiversity outside the protected area network
 3. Eco Development
 4. Emergent action (campaigns) to prevent destruction of biological diversity
 5. Strengthening the legal and policy framework
 6. Applied research in biodiversity conservation
- Projects and programmes under

each of the heads were identified through a series of planning workshops and commissioned studies in both zones. When the International Convention on Biodiversity was seriously discussed at the national level and finally put into effect in December 1993, it was adopted as the framework for implementation for BHCP.

The Convention on Biological Diversity, to which India is signatory, provides an appropriate planning framework for WWF INDIA's Biodiversity Programme and hence for BHCP. The projects implemented under BHCP, the background monitoring of biodiversity, and the policy analysis and lobbying contribute to the comprehensive requirements of the CBD in the two biogeographic regions. In summary, the Convention calls for the following.

1. National Strategies and Action Plans (Article 6)
2. Identification and monitoring of the components of biodiversity (Article 7)
3. *In situ* conservation (Article 8)
4. *Ex situ* conservation (Article 9)
5. Sustainable use of the elements of biodiversity (Article 10)
6. Incentive measures (Article 11)

7. Research and training (Article 12)
8. Public Education and Awareness (Article 13)
9. Impact and assessment and minimising adverse effects (Article 14)

It should be noted that biodiversity is subjected to macro-level processes such as:

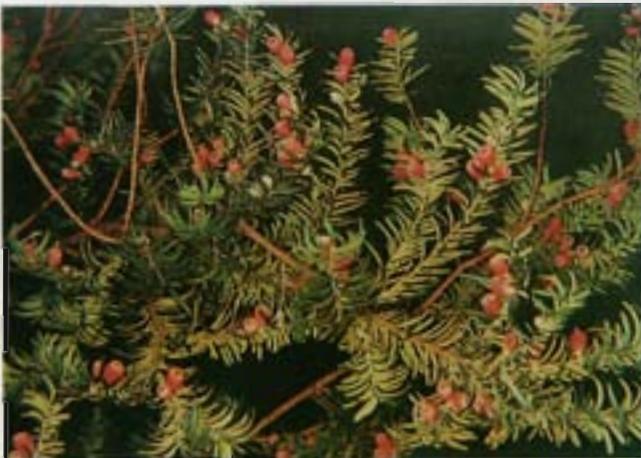
1. structural adjustment policies,
2. population changes due to migration,
3. changes in lifestyle, e.g., the increase of consumerism,
4. increased awareness among politicians, and
5. the reassertion of ethnic identities.

Lessons Learned

The main merit in the broad, facilitative catalytic approach to biodiversity conservation adopted by BHCP lies in the fact that the programme could remain alert to evolving priorities and 'gaps' that needed concerted attention. Clearly, one priority area in which much "sub-critical" activity takes place, that is crucial for biodiversity conservation in India, is livelihood from conservation of biodiversity and the sustainable use of its components. As in the case of exploring *Taxus baccata*, widely believed to be a cure for cancer, powerful commercial interests could wrest away community control over its resources.

Inter-Country Collaboration on Biodiversity Conservation in the Eastern Himalayas

BHCP has identified possible regions for trans-national parks, based on the work of the Wildlife Institute of India and the State Forest Departments of Sikkim and Arunachal Pradesh. Transnational collaboration in biodiversity conservation should be based on sound scientific principles



LU RONGSEN

Common yew (*Taxus baccata*), a Himalayan species believed to offer a cure for cancer

and carried out in a transparent and politically sensitive manner. MacArthur grantees in each country, i.e., Nepal, India, Bhutan, China, and (in future) Myanmar, should consult their governments and take the initiative of putting forward scientifically sound plans for field assessments and information exchange to facilitate biodiversity conservation.

BHCP has made an effort to continuously collate information on current official and non-governmental biodiversity conservation programmes in the Western Ghats. This is carried out primarily by the WWF INDIA Data Centre for Natural Resources in Bangalore and the WWF INDIA Secretariat in New Delhi. There is a proposal to publish a Western Ghats newsletter in collaboration with a partner NGO, viz., the Wildlife Association of Ramnad District (WARD).

There is a need for better inter-programme communications in coordinating and developing synergies in the implementation of MacArthur supported biodiversity conservation programmes in the Western Ghats and the Eastern Himalayas. It would be useful to establish a MacArthur Grantees' Consultative Forum to facilitate an exchange of ideas and initiate complementary activities.

Though there is informal contact between programme staff, no formal communication, coordination, and consultation mechanisms exist at present.

Discussion

Dr. Bawa said the project in the tribal area plans to add value to NTFPs to increase income and to make extraction sustainable. Rural communities share a disproportionate cost of biodiversity maintenance and further studies are needed to find out whether

Rural communities share a disproportionate cost of biodiversity maintenance and further studies are needed to find out whether extraction can be sustainable.

extraction can be within sustainable limits. The extraction rates of non-timber forestry products vary between the two sites, e.g., the rates in the BR Hills are much higher than at the other site. An example of NFTP extraction with high economic returns is broomstick grass (*Amriso*) in Darjeeling and Amla.

Dr. Sukumar said that his project had not yet looked into NFTP availability and extraction but would soon do so. Dr. Mathew said the government had made a major change in its environmental policy framework in the preceding three to four years. Recently, the Government and NGOs had begun to work more closely. In his view, there had been a significant increase in the public's awareness of wildlife conservation in India.

■ Nepal

Chairing the session, Dr. Sharma, Department of National Parks and Wildlife Conservation, Nepal, said that the theme of the session should have been how circumstances of conservation had changed since 1991. Dr. Sharma said protected areas encompass 14 per cent of the country. The protected area system evolved from traditional style national parks in the lowlands to different types of national

park, e.g., the Annapurna and Makalu-Barun Conservation Areas. Changing circumstances dictated a change in the administrative system of protected areas too. He said the administration aspect was critical in successful conservation.

Mr. Anil Chitrakar, Director of Environmental Camps for Conservation Awareness (ECCA), Nepal, gave his presentation on ECCA activities.

Since its inception in 1987, ECCA has conducted a series of programmes with the objective of educating and mobilising school children in conservation and better resource management. The ECCA methodology entails a three-tier structure: 1. a three-day counsellor's training camp to train local youth, 2. a five-day ECCA camp to train school children, and 3. the non-formal and continuous transfer of available skills, technologies, and information to other classmates, parents, and the community as a whole, thus facilitating the formulation of locally-designed environmental plans. In six years, ECCA has covered 32 districts with a total of 700 members. McArthur support has enabled ECCA to take its activities to the eastern *terai*.

ECCA is unusual in several respects.

The revival of traditional forms of organisation and the building of new local institutions where appropriate can empower these communities with the means to counterbalance outside forces, enabling them to conduct development activities that match their actual needs and cultural frameworks.

It takes camps to children, thus accommodating diversity in "topography;" it is interdisciplinary - it provides the total picture; it acts as a catalyst so that there is an "organic chemistry" in the exchanges between experts, youth, and children; it links supply and demand sites and initiates the process of reversing the damage that has already occurred as in the Shivapuri Watershed case where the ECCA camp generated a demand for 250 stoves. Children went on field trips to learn about pond ecology at the local village pond, visited cultural sites to make an inventory of their heritage, and learned about natural processes such as how photosynthesis works.

No programmes have yet been planned for children not attending school. Ironically, children are kept away from school by chores such as collecting natural resources for sustenance; environmental education is thus more important to them. ECCA has set up a paper recycling plant with the help of Development Alternatives.

Ms. Jeannette Gurung, of ICIMOD, presented a slide show on "Promoting Participatory Agroforestry" to introduce ICIMOD's project in Nepal and China, noting that the following day would be devoted to a comprehensive discussion on the results of ICIMOD's action-research.

As remote mountain residents of two protected area buffer zones, the farmers of two ICIMOD project sites - Yunnan Province in China and Sankhuwasabha District in Nepal - have little access to technical advice, services of government extension agents, inputs such as improved seeds and fertilisers, or markets, with which they could improve their private sources of biomass and reduce use of the Protected Area's resources. Besides the insufficiency of regular exten-

sion services, these areas lack strong, alternative village-based organisations that could act as intermediaries between farmers and government agencies and provide such assistance. Where such services do exist, they are usually determined by planners far removed from hill farming. Therefore, they design inappropriate programmes that cannot be sustained by the communities themselves.

The majority of farmers in the two areas belong to ethnic groups other than mainstream Chinese and Nepali nationalities. Their traditional cultures are encountering challenges posed by migration, tourism, and development. The strong spiritual values prevalent in their societies have provided a dimension of life that is under stress from modernising elements. The revival of traditional forms of organisation and the building of new local institutions, where appropriate, can empower these communities with the means to counterbalance outside forces, enabling them to conduct development activities that match their actual needs and cultural frameworks.

The fundamental concept underlying this project is that the transfer of technical knowledge cannot occur without prior strengthening of local capacities, nor without an understanding of local land-use practices and cultural values. Therefore, project activities began only after acquiring a knowledge of this background by a participatory process involving local leaders and the farmers they represent.

The task of strengthening local organisations in the two project areas is being undertaken through a partnership with two organisations, SAGUN in Nepal and the Kunming Institute of Botany in China, in conducting research on indigenous knowledge and cultural factors related to

agroforestry/forest management. Training, the major component of all activities, is provided on the technical aspects of agroforestry and in organisational management. Assistance is provided to the local organisations to develop links with government and non-government resource institutions and with other farmers in the region from whom effective new technologies can be learned.

Dr. J. G. Campbell, Woodlands Mountain Institute (WMI), USA, introduced his organisation, which supports integrated programmes for biodiversity conservation and sustainable development with partners in Nepal and the Tibetan Autonomous Region (TAR), China: the Qomolangma Nature Preserve (QNP) in TAR, the Chinese Academy of Sciences's Institute, TASS, and the Tibet Development Fund; and the Makalu-Barun National Park & Conservation Area in collaboration with the Department of National Parks and Wildlife Conservation of Nepal and cooperating scientists.

These two separate national parks linked up with other existing parks in Nepal and Tibet to create continuous protected corridors over an area roughly the size of Switzerland. Citing the physical diversity and rich biological diversity of the two areas, Dr. Campbell said the high variation in rainfall (200-5,000mm) and remoteness were other factors in making the Mt. Everest and the Upper & Lower Arun areas genuine "hotspots" where both Nepali and Chinese scientists have found new evolving species. As elsewhere in the Himalayas, people form an integral part of the ecosystem. Therefore, these areas were designated as protected areas with the aim of finding innovative solutions to biodiversity conservation, of establishing effective protected areas

(PAs), and of mini-mising conflicts between people and parks.

Dr. Campbell said WMI's Himalayan Programme objectives are to develop new models for integrating local people in park management by combining biodiversity conservation with sustainable development; integrating interdisciplinary, innovative research with management needs; planning PA management through interdisciplinary teams of local scientists and parks' specialists using participatory research; building new forms of international and local partnerships between governments, INGOs, NGOs, and research institutions; building local sustainability through enhancing indigenous management capabilities; and facilitating cross-boundary and international linkages and exchanges.

Dr. Campbell highlighted the recent lessons and changes and the future challenges. The recent lessons and changes include the need for new models to integrate local people in park management (widespread acceptance and application, conservation area/buffer zone model with biodiversity zoning, integration of cultural conservation and traditional resource-use value, incorporation of women in management); combining biodiversity conservation with participatory sustainable development (user group resource management with integrated biodiversity objectives - forests, pasture, livestock, vegetable seeds, use of Participatory Rural Appraisal (PRA) models and new techniques for village planning, sustainable livelihood, and income enhancement through biodiversity, gender focus on women's key roles and opportunities - user groups, income generating and training programmes, scouts); integrating research and management (management initiated and coordinated research,

interdisciplinary methodology, integrated biodiversity database, mapping and coordination, innovative linkages of the research process with concerting indigenous knowledge and training local resource custodians); planning PA management through interdisciplinary teams and participatory research (task force approach, linking scientists, park managers, local people, translating results into a plan framework and operational plan-log frame with extensive review, utilising team planning methodologies); building new forms of international and local partnerships (government-INGO-NGO, partnerships with local people, management, research partnerships, international conservation community and donor partnerships, capacity building-technical, managerial, financial); promoting local sustainability by improving approaches (user groups, village planning), local training and conservation education, critical support and innovative cross-boundary and international exchanges/linkages, role of INGOs in facilitating unofficial exchange and in scientific conflicts; biological sustainability, economic viability, and locally perceived linkages to conservation; achieving synergy and cumulative results, interdisciplinary methodologies, information sharing, linkages with field managers; refinement and application of existing PAs in the Himalayas; evolving effective models and clarifying areas for joint and complementary activities, bridging organisational culture gaps - the best of both worlds; reaching all critical communities and ensuring sufficient biodiversity conservation compatible incomes; systematic information exchange, joint research and management mechanisms, and financial support.

Mr. Thapa, King Mahendra Trust

for Nature Conservation (KMTNC), Nepal, said that KMTNC had been receiving financial support from the MacArthur Foundation since 1988 to develop the institutional capacity of the Trust in terms of equipment and human resources. In addition, MacArthur had also assisted the Nepal Conservation Research and Training Centre (NCRTC) of the KMTNC in the Royal Chitwan National Park (RCNP).

Mr. Thapa said the Annapurna Conservation Area Project (ACAP) was the most significant achievement of the KMTNC. ACAP played the role of a catalyst in a situation where people's participation as well as financial sustainability were necessary for the programme to be successful. The Department of National Parks, and Wildlife Conservation (DNPWC) had adopted a legislation in 1986 to use the revenue from national parks to benefit the communities settled in the vicinity of the parks in recognition of the fact that conservation and development are not mutually exclusive. The establishment of community plantations outside both Chitwan and Annapurna had given people an alternative source of the natural resources required for every day use, e.g., fuelwood. At ACAP sites, locally made micro-hydro plants had been installed and were locally repairable. More hydro-plants are planned in the ACAP region.

Mr. Thapa believes that most donors are willing to assist scientific projects but the problem of meeting recurring costs remained (basic infrastructure and human resource development). This was the major constraint Nepali NGOs faced. The WWF and MacArthur Foundation support had enabled KMTNC to undertake more project work, but future assistance was needed.

Discussion

Noting that wildlife had rarely been mentioned in the presentations, Dr. Rabinowitz asked what had been done about poaching in Nepal and if regular surveys of wildlife were being conducted. In response Dr. Sharma said that the MacArthur Foundation had funded efforts to control rhino poaching (for horn). Poaching of tigers and bears (for bones and gall bladders respectively) occurred in Nepal. Although the Chitwan and Bardia national parks were protected by the army, rhinos often crossed into adjoining forests and croplands outside the army jurisdiction. Anti-poaching units of local villagers had been organised to inform the DFOs; who had armed guards. The International Trust for Nature Conservation had provided assistance in this. In Tibet, since new regulations on the export of wildlife products were enforced, there had been no poaching incidents in the preceding three to four months.

Mr. N. Ishwaran suggested that creating buffer zones with the local people's participation might be useful in dealing with the problem of species wandering outside park boundaries. For example, the cluster of reserves protecting the giant panda

The biggest challenge lay in maintaining the required level of biodiversity in the existing national parks and not in setting up more parks. More areas should be declared buffer zones.

habitat in China were linked by corridors. He said that emphasis should not only be limited to increasing the benefits derived by the people and that animals need a larger habitat.

Mr. Mingma Sherpa pointed out that over 60 per cent of the park's budget in Nepal was spent on protection units, but the focus had now shifted to people's participation in protection and in management.

Responding to a query, Ms. Gurung confirmed that ICIMOD was drawing upon local knowledge on the uses of local plants. To another query, Dr. T.B.S. Shrestha said that orchids and medicinal herbs growing at altitudes over 4,000m were being overextracted in the lower region of the Makalu-Barun area. Some medicinal herbs/plants were protected by the law only in theory. The bark of Daphne (used for making Nepali paper) was also being over-harvested. Nettle fibres (the longest known botanical fibre) were used for fishing lines and to make *allo*, a certain tweedy type of cloth. A specific programme had been started for its development and for research on *allo*.

Dr. Byers added that the Makalu-Barun project had adequate funding to fill the existing knowledge gaps and that research on plants and sustainable harvesting was continuing. A Chinese participant said that cross-border smuggling (Pakistan, Nepal, Tibet-China, Mongolia) was a big issue and suggested that a survey be conducted to determine the extent of the problem.

Dr. Sharma stressed that the biggest challenge lay in maintaining the required level of biodiversity in the existing national parks and not in setting up more parks. More areas should be declared buffer zones (forest areas and private lands). Thirty to 40 per cent of the revenue

should be ploughed back by the user groups into community development. Unless trans-boundary PAS are established, it will not be possible to preserve the whole ecosystem. The Valmiki Tiger Preserve (in India) and the Chitwan National Park and the Parsa Reserve (in Nepal) could support 180 tigers. In Dr. Sharma's view, the root cause of people and parks' conflicts was poverty. Unless income is generated, the conservation problem cannot be solved.

General Discussion on Grantees' Presentation

Dr. Bawa identified the following changes in biodiversity management:

- increased knowledge of biodiversity,
- more receptivity on the part of individual governments,
- improvement of and innovation in methodologies (for example, incorporation of GIS in monitoring, mapping vegetation, etc),
- standardisation of protocol for biodiversity monitoring,
- environmental education,
- opportunities for exchanges of ideas and more interaction among people working in the region, and
- although changes in economic development exert pressure on biodiversity, linking biodiversity management and development could be an opportunity.

He identified the challenges as:

- involving local people and accepting their practices and values,
- inadequate understanding of interactions between local people and wildlife: poaching was still a serious problem,
- role of women in management, and
- intellectual property rights: the question of compensating the local people for extraction of their indigenous knowledge.

Dr. Ramakrishnan called for a degree of commonality in methodologies for linking case studies so that valid conclusions can be derived. The linkages between social and ecological sciences are not well developed, thus there is a need for such linkages. Human resource development, in Dr. Ramakrishnan's view, is a key to tackling these issues. He said specific recommendations are required for the replication of methodologies and experiences.

Dr. Bawa said some countries, such as Bhutan, had high levels of biodiversity outside the Protected Areas, whereas others had little. Dr. Ishwaran said UNESCO was very interested in trans-boundary cooperation. He said that multilateral cooperation was necessary, as in the example of Manas National Park where the Indian side of the park is protected but where there is uncertainty over what happens on the Bhutan side. At this, Dr. Campbell stressed the need for database, biological inventories, and joint management decisions in the case of contiguous national parks across borders.

Dr. G. Martin said NTFPs provided a theme for developing a common methodology in which the field of ethnobotany was important. He questioned whether local people were made part of the research team or not. He also noted that while many resource users are women, it is mostly men who are engaged in the research. Dr. Bawa noted that the local communities - through NGOs - indicated the kind of programme activities that interested them.

Dr. Sukumar called for the cultivation of endemic trees, plants, and for NTFP to be encouraged outside the PAs. Mr. Mingma Sherpa noted the importance of institutional sup-

While many resource users are women, it is mostly men who are engaged in the research.

port and the development of human resources. Dr. Mundy said the introduction of agroforestry schemes would enrich biodiversity outside the PAs.

Mr. Yin Bing Gao said that, from the management point of view, trans-boundary conservation, between Nepal and the Tibetan autonomous region, for example, would be effective in controlling poaching.

■ China

Prof. Wang Sung, of the Endangered Species' Scientific Commission, PRC, said that support from the MacArthur Foundation enabled Chinese conservation scientists to link up with international conservation. He recalled that China had signed the Convention on International Trade in Endangered Species (CITES) in 1981. The two major objectives of the project were to: i) operate the



Sika deer (*Cervus nippon szechuanicus*) inhabit the Chinese Himalayas

Endangered Species' Scientific Commission (ESSC), a task of two components - communications and transport and facilities, personnel employment, and miscellaneous; ii) link Chinese institutions and experts with international agencies, for example, the MacArthur Foundation projects, Biodiversity Working Group/CCICED (China), CITES issues, IUCN, Chinese specialist groups, MAB/UNESCO, and others. The Biodiversity Working Group/CCICED projects covered a wide range of issues such as wildlife trade, *in situ* conservation status, *ex situ* conservation of endangered plants and animals, a meta-database of biodiversity in China, and so on. The BWG/CCICED held a meeting in Hainan which was followed by field surveys.

Professor Wang Sung said there are opportunities for cross-boundary conservation, e.g., between China and Mongolia, and China and Russia. Collaboration is necessary - and IUCN is interested in opening an office in China. Training programmes for students was a means of raising the awareness of the general public about conservation. He said conservation programmes and activities - as well as the status of biodiversity in China, especially endangered species - needed assessing. Threatened species and groups include musk deer, bear, pangolin, leopard, bats, etc.; a species inventory was needed for accurate data on these species. A database on marine species was needed too. Prof. Wang Sung said the ESSC is working towards these. He talked about the Status Report and Action Plan for Biodiversity Conservation, which include the assessment of the Biodiversity Status of China, China's Biodiversity Action Plan, and Action Planning for Species/Groups. It also includes proposals for building a national

biodiversity database, trade survey, quota-setting, e.g., for leopard cat and bear-farming evaluations.

Prof. Wei Zhi Ji, of the Kunming Institute of Zoology, Chinese Academy of Sciences, said that the Kunming Institute of Zoology (KIZ) and the Wildlife Conservation Society (WCS) were collaborating to train and aid conservation researchers and managers as well as to survey the tropical and subtropical forests of the Gaoligongshang region in Yunnan.

Five surveys have been carried out, covering 25,000 sq. km. Altogether 485 species of birds and 176 species of mammals were recorded, among which were nine new bird and eight new mammal records for Yunnan. Other new species could include a small muntjak and a hedgehog. Of the species newly recorded, 36 per cent of mammals and 68 per cent of the birds were found at elevations under 2,500m; 71 per cent of the mammals inhabited terrain between 2,000 and 3,000m while 60 per cent of the birds were found between, 1,000 and 1,500m. The highest species' density - 842 per 100 sq. km. (mammals) and 74 per 100 sq. km. (birds) - occurred in areas between 210 and 500m where human population densities were lower than those at higher altitudes.

Prof. Wei Zhi Ji said the main threats to conservation are deforestation, resulting from agricultural encroachment, tobacco plantation, firewood collection, logging, and poaching. A computerised database centre has been established based on the mass system, with a Chinese version for those unfamiliar with English. The data would be available to the Forestry Department and other users. The database covered information (both field data and publications' reviews) on i) species, habitat, and

the protected area's conservation system, e.g., established nature reserves, protected wildlife, endangered wildlife, mammals, birds, and reptiles in China; mammals, birds and amphibians in Yunnan; mammals, birds, reptiles, and amphibians in the Gaoligongshang region; and ii) management system of vertebrate specimens at the KIZ, including a database of bird, fish, mammal, reptile and amphibian specimens (in preparation) as well as data on and location of the collections.

The first Wildlife Research and Conservation Training Course held in Xishuangbanna (March 1993) was attended by Forestry Department staff from all over southwest China. The first Wildlife Conservation Workshop for teachers was held at the KIZ (March 1994) in which teacher-trainers from New York and researchers from the KIZ taught primary and middle-grade teachers from Kunming and Xishuangbanna to develop a curriculum for life sciences' instruction and biodiversity conservation. The use of calendars, articles on wildlife conservation, and other media (T.V.) in teaching conservation education to students and the general public was highlighted.

The KIZ also networked with Yunnan Provincial Forestry Department and Kunming Institute of Botany (KIB) to carry out biota surveys in Xishuangbanna and Gaoligongshang and to compile data and forward recommendations in designing management plans for the region. Villagers were encouraged to participate in wildlife protection and the programmes of the last two years had been successful (wild surveys and public education). As a region rich in biodiversity, Gaoligongshang required an immediate, integrated research programme that included monitoring wildlife

Qomalongma Nature Preserve

MRS. DROLMA YONGZOM, Deputy Director, Working Commission, Qomalongma Nature Preserve, gave a slide presentation of the Qomalongma Nature Preserve (QNP). The QNP covers an area of 34,480 sq. km. with mountain peaks such as Qomalongma (Everest 8,848m), Luozi (Lhotse 8,501m), Makalu (8,470m), Zhou-o-you (Cho-oyu 8,153m) and Xixiabangma (Shishapangma 8,012m); the lowest elevation was Zhangmu (Dram) at 1,433m. The bioclimatic zones range from subtropical to nival and the major rivers are the Jilongzangbu, Mashangzangbu, Rongxiazangbu, Xininingzangbu, and Pengqu (Arun).

Located in southern Shigatse Prefecture in the Tibetan Autonomous Region of China, QNP covers Jilong (Kyirong), Nielamu (Nyelam), Dingri (Tingri), and the western part of Dingjie (Dingque) counties.

A 12-year (1989-2000) agreement has been signed between the Working Commission of the QNP of the Government of the Tibetan Autonomous Region (TAR) of China and the Woodlands Mountain Institute (WMI), and by the latter with the Tibet Development Fund and the Institute of Botany. The area is extremely rich in plant and animal diversity, e.g., 2,300 species of plants and 100 species of animals. An increasing population had exerted growing pressure on natural resources, e.g., fodder and fuelwood. Planning for balance in development and conservation - human survival and protection of the nature reserve - is a problem.

Mrs. Yongzom said illegal hunting and logging on the Tibet-Nepal border made environmental education vital in order to raise the awareness level and management methods. She said certain areas have to be demarcated to develop the local economy, eco-tourism, and the promotion of local handicrafts as options to improve biodiversity.

populations, improving the local economy, and better reserve management methods. Prof. Weizhi Ji called for the continuation of public education programmes for officials, local people, reserve managers, and staff, including teachers, and said the programmes should be expanded to cover south-eastern Tibet and northern Burma.

Prof. Xu Zaifu, Director of Xishuangbanna Tropical Garden, spoke about the project demonstrating integrated conservation and sustainable development systems in the tropical forests of southern Yunnan. In implementation since 1992, the project was supported by MacArthur, Mengla county, Jinhong city, and the

National Committee of Science and Technology, China.

The objective of the project, undertaken by the Xishuangbanna Tropical Botanical Garden and the Chinese Academy of Sciences (CAS), was to conserve and judiciously use the natural resources of Xishuangbanna as well as to coordinate the development of the rural economy of the ethnic communities, natural resources, and indigenous knowledge. Two villages - Manwo village of the Dai people in Menglum Township, Mengla county and Manmuo village of the Akha in Menghan Township, Jinhong city - were selected as sites for demonstration and technology training. Based on socioeconomic and physical environmental survey and analysis, a project team of scientists, village officials, young villagers, and women was formed. The design for project implementation was based on the natural resources and socioeconomic development of the area, combining modern and indigenous knowledge, as well as the requirements/demands of local officials and villagers. The project was implemented by the farmers for the villagers' benefit, with technical support from the technicians funded by the project.

In Manwo village, project activities included tropical fruit development, cultivation of rare and fragrant plants, vegetable seed production, rural fuel development, tourism village construction for preservation of the Dai ethnic culture, and technique training for fruit, cash crop, and vegetable cultivation, consisting of breeding, plantation, grafting, and hybrid seed production. In Manmo village, project activities consisted of tropical fruit development, vegetable seed production, paddy rice cultivation, forest and minor forest products' utilisation, ecological

tourism in tropical rainforest areas, and technique training for fruit tree breeding, grafting, plantation, cash crop cultivation, tourism development services, the determination of scientific names, and the value and main ecological features of plants. The Xishuangbanna Tropical Botanical Garden served as a base for conducting technical training and science education programmes for farmers in the two project villages. Farmer-to-farmer exchanges and visits were organised and scientists working in the Botanical Garden introduced the farmers to various cash crops, regeneration and plantation techniques, and agroforestry technologies.

A paper on the 'Relationship between Indigenous Botanical Knowledge of the Dai and Rural Development in Xishuangbanna, Yunnan, China' was written by the project members. In 1993, reporters from the Fourth Department of Central China Television were invited to make a programme on the Indigenous Knowledge of the Dai people and plant diversity. The programme focussed on wild plant resources and their specific usage (edible flowers, canoe, Dragon's blood used in Chinese medicine, etc.); Buddhist sutra culture of the Dai and its relationship with plants; the use of *Cassia Siamea* as fuelwood; tropical agroforestry systems; and sustainable utilisation of tropical rainforests.

Mr. Li Gui, Director General of Yunnan Forestry Department, said that biodiversity conservation is important as biodiversity determines the level of human civilisation and that forestry is the basis of the national economy. The development of the world economy, rapid in some areas, had exerted pressure on biologically diverse resources, pressure which increased with economic growth. It is necessary to improve people's living standards - but

not at the cost of natural resources, Mr. Li Gui remarked. A reasonable way of using natural resources had to be found so that there was a balance between people and the environment to ensure sustainable development.

Mr. Li Gui said the MacArthur Foundation had provided funds for a project in Yunnan province in 1982. The project had been successful because of the collaboration between the Kunming Institute of Botany and the Kunming Institute of Zoology. Networking with like-minded agencies and institutions, Mr. Li Gui said, enhances international cooperation.

Dr. Alan Rabinowitz noted that Laos had virtually no protected areas when it opened up a few years back. The MacArthur Foundation had funded a training programme for the Forestry Institute management staff, and the Wildlife Conservation Society (WCS) had assessed local use of wildlife resources. In October 1993, the Laotian government created 17 new PAs covering more than 10 per cent of the country's area and outlined a strategy for a PA management system. The government invited Wildlife Conservation Society (WCS) assistance to assess wildlife resources and critical habitats within the new PAs, to train new staff in PA management, and to assess the needs and activities of the communities living within these PAs. A survey had been completed of the country's largest PA, the Nakai-am Theun; five new birds, one mammal species for Laos, and a new mammal species for the world had been discov-

ered. As requested, WCS would make its assessment and make recommendations that would integrate community development with wildlife conservation. As an underdeveloped country, Laos was attempting PA management for the first time.

The challenge for the future was to protect and manage some of the area's wildlife resources in the face of rapid economic development. In Myanmar, Dr. Rabinowitz pointed out, there were 14 PAs (approximately 1.1% of the total area), which the Government wanted to increase to seven per cent. Yunnan provincial authorities and the Burmese government were working closely to manage and harvest timber resources and to fill the existing knowledge gaps.

Discussion

Professor Pei Shengji noted that similar ethnic groups live in Myanmar, China, and Laos. Culture is therefore important for biodiversity conservation in the Eastern Himalayas. These ethnic groups had preserved their traditional practices and approaches; for example, one ethnic group used tree leaves to communicate. Professor Pei warned that, in the next five to 10 years, changes would occur rapidly as a result of economic growth and the expansion of the transport network.

Replying to a question, Dr. Rabinowitz said people from all over China attended Yunnan's training programmes as the province was a "hotspot" for environmental education.

ICIMOD Seminar
*Indigenous Knowledge Systems
and Biodiversity Management*



MUKTA LAMA

Rai carrying water in bamboo container

The seminar on 'Indigenous Knowledge Systems and Biodiversity Management' opened with a welcome address by Mr. Egbert Pelinck, Director General, ICIMOD. He thanked the MacArthur Foundation for making the meeting possible and for supporting ICIMOD's project on the Promotion of Agroforestry through Local Institutions in the Eastern Himalayas.

In the 10 years since ICIMOD's establishment, considerable progress had been made in highlighting the plight of the mountain people and their fragile environment, Mr. Pelinck said. This is reflected in a special chapter in UNCED's Agenda 21 on "Sustainable Mountain Development." This growing awareness is matched by an increasing body of knowledge on constraints and opportunities for development, in Mr. Pelinck's view. ICIMOD's library has collected more than 12,000 publications and articles. The task of documenting indigenous knowledge is of extreme urgency. In his view, the old approach to biodiversity management had, or would have, resulted in islands of conservation amid deserts of ecological degradation. Therefore, a new concept that does not end but starts at the boundaries of parks and reserves is required: natural resource management with people and for

people. Mr. Pelinck urged participants to take up the challenge of building on indigenous knowledge while responding to the rightful aspirations of people who are outside mainstream development processes.

Prof. Pei Shengji introduced the topic of the seminar - indigenous knowledge of mountain people and its role in conserving biodiversity in the mountain ecosystems. As the world's largest mountain system, the Himalayan region has unique functions and roles in terms of biodiversity. Prof. Pei referred to the rich biodiversity of the region as "a store of resources." The ecosystem, species, and genetic diversity supported and contributed to human existence and well-being; throughout history the interaction between mountain people and the natural system had helped communities to maintain the richness of species, communities, and genetic materials in both the productive systems and wild lands of the mountain environment. Warning that the fundamental natural wealth is disappearing, Prof. Pei said it is crucial to slow down and halt this process of impoverishment and degradation.

Mountain forests have a cultural value for the local population, said Professor Pei. For example, the *Dai* people believe the forest is man's cradle. Indigenous people have a tradition of indigenous practices to maintain forests as a sustainable resource system characterised by the management of non-timber forest products, as in Nepal, China, and India. Swidden cultivation is practised by all mountain ethnic groups in the Eastern Himalayas, for example, reflecting the man-environment relationship. Therefore, swidden agroforestry systems and local models should be identified, e.g., rattan-swidden cultivation in Yunnan. Professor Pei stressed that the under-

The old approach to biodiversity management had resulted in islands of conservation amid deserts of ecological degradation; a new concept that does not end but starts at the boundaries of parks and reserves is required.

standing of mountain people's indigenous knowledge of biodiversity resource management is a key to sustainable development in the Himalayan region. Natural resource management systems are localised systems that form a basis in rural people's decision-making. He reviewed indigenous perceptions and practices regarding the management of mountain forests for the protection and utilisation of biologically diverse resources. He also discussed the coexistence of biological and cultural diversity in the Himalayas in view of ethnobotanical approaches. He said that 70 to 80 per cent of the mountain population depended on traditional medicine and health care. In India, Nepal, and China, medicinal plants are the primary sources of medicine. In concluding, Professor Pei said it was important for scientists and planners to understand and improve the prevailing conditions in biodiversity resource management. Grassroots' participation is necessary in biodiversity conservation and development strategies should be based on an understanding of indigenous knowledge. As a science of documenting traditional knowledge on the use of plants by indigenous people and assessing the human interactions with the natural environment, ethnobotany has great potential for contributing to biodiversity conservation in the Himalayas.

Ms. Gurung, speaking on indigenous knowledge systems and their role in development, began by saying scientists and development workers have to accept the challenge of working together in their search for sustainability, participatory processes, and alternative development paradigms.

"Indigenous knowledge", or IK, refers to the empirical knowledge of a group of long-time inhabitants of a spe-

As indigenous communities are absorbed into mainstream societies, there will be a loss of undocumented IK.

cific locale, and the principles underlying its generation, organisation, meaning, and diffusion. This definition includes the knowledge system of "indigenous peoples" who claim to be original inhabitants of an area. Ms Gurung noted that IK is not static but dynamic in nature as it is generally transmitted orally and provides the basis for decisions related to land use, natural resource management, and other tasks. IK consists of dynamic insight and techniques gained through trial and error in response to changing environmental and socioeconomic circumstances and opportunities.

Ms. Gurung said the participation of community members in development processes can be enhanced by the elicitation of IK. She noted that women's knowledge is largely ignored by male members of society and outside development agencies. Similarly, the knowledge of shamans, traditional healers, elders, and midwives is known



Diversity of forest foods prepared by the Yi people of Chuxiang, China

*A marriage of
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only to them. This special knowledge must be elicited and recorded. The study of IKs would encourage the local people to feel a sense of legitimacy in their knowledge and belief systems; such introspection could contribute to the empowerment of local communities, enabling them to take an active role in shaping their own future.

She warned that, as indigenous communities are absorbed into mainstream societies, there would be a loss of undocumented IK, which would be a loss to scientists trying to learn sustainable ways of existence with nature. Comparing IKs and scientific systems, Ms. Gurung said that variations in the depth and breadth of local knowledge systems exist due to the capacities of communities and individuals to generate, experiment, utilise, and transfer knowledge, depending on varying socioeconomic and environmental conditions. Nothing that these knowledge systems exist in varying degrees of intactness, she said researchers could assess IKs by adopting an emic perspective. She stressed that the subject has

*Development that does not
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may not be sustainable.*

to be approached from the indigenous person's paradigm.

Ms. Gurung does not believe there is a need to subject IKs to rigorous scientific testing to render them of value to the world. A marriage of traditional and modern scientific knowledge is necessary to solve the problems of poverty and environmental deterioration. She noted, however, that all local practices are not sustainable. There could be several obstacles to integration of IKs and science such as: 1. loss of IK due to intrusion of the State and market forces as well as the dying out of elders possessing oral-based knowledge which once lost cannot be retrieved; 2. IKs have a spiritual base in that the world views of scientists and indigenous communities are based on radically different assumptions about the nature of the world; and 3. the existence of cultural, perceptual, and language barriers prevents both groups from acknowledging the value of each other's system of knowledge.

Ms. Gurung concluded by saying IK should be returned to the communities to improve their lives in some way: the knowledge is from and for the people. Any development that does not incorporate the culture and values of a society may not be sustainable.

Following these background presentations came the presentation of the results of ICIMOD's MacArthur Foundation-sponsored project in eastern Nepal and southwest China by staff of the two collaborating institutions - SAGUN and the Kunming Institute of Botany (KIB). The findings of this action research project and a description of methods were presented during four panel sessions, led and advised by prominent persons in the field of biodiversity management and indigenous knowledge.

Panel A

Methodologies

Dr. Evelyn Mathias-Mundy of the International Institute for Rural Reconstruction (IIRR) was Panel leader, Dr. Leo Avgeusau was resource person, and Mr. Mukta Lama of SAGUN, Nepal, and Mr. Long Chun-lin of the Kunming Institute of Botany presented project findings.

Nepal

Mr. Mukta Lama (SAGUN) introduced the field site in eastern Nepal and spoke on Participatory Action and Research on Indigenous Knowledge Systems.

Tamku village is located on the southern slopes of Makalu in the eastern hills of Nepal in the Sankhuwasabha district. The village falls within the boundary of the Conservation Area designated by the Makalu-Barun National Parks and Conservation Area Project (MBNCAP) and consists of 25 hamlets (approx 25 households) inhabited mainly by members of the *Rai* ethnic group, which is made up of the *Mewahang* and *Kulung* sub-groups.

The *Rai*, as descendants of the *Kiranti* people, follow a culture and religion that is distinct from mainstream Hinduism and Buddhism. *Rai* myths and rituals, as well as their environmental practices, depict a close relationship between human beings and nature. Mr. Lama pointed out, however, that the indigenous cultural heritage had been affected by the assertive influences of the mainstream culture and people were increasingly developing a "culture of submission."

Rai livelihood centres on food security. They practice relatively stable agriculture on steep rainfed terraces, supplemented by slash and burn culti-

The indigenous cultural heritage had been affected by the assertive influences of the mainstream culture and people were increasingly developing a "culture of submission."

vation. Despite their efforts, 75 per cent of the families of Tamku experience a chronic food deficit for three to nine months every year. However, the diversity of agroforestry practices in Tamku is rich and their natural resource use pattern exhibits a high level of suitability proven through generations of trial and error, e.g., knowledge regarding forest and fodder plants, their uses, combinations of forest and agriculture species, seasonality of migration within their '*Carri*' (territory), soil fertility management, and genetic resources' management.

SAGUN began with IK as the starting point, then proceeded to systemise and amplify it by building and strengthening the capability and power of formal and informal grassroots' community institutions through action and in collaboration with external agents. SAGUN initiated Participatory Action Research (PAR) and dialogue with the local people. Mr. Lama explained that the methodology consisted of exploratory and explanatory visits, followed by participant observation; informal but renewed contacts with the villagers; training of local intellectuals and activists (especially on research methods such as Participatory Rural Appraisal); encouragement of the experimental tradition of farmers; identification and organisation of grassroots' groups; identification of crucial issues as well as discussions on them; networking with government agencies, MBCP and NGOs; and awareness-raising

about problems that need to be addressed by collective action.

China

Mr. Long Chun-lin, of the Kunming Institute of Botany (KIB), gave a description of the site in Yunnan, then discussed the methods used by the KIB team to conduct action research.

The project is the Zixi Mountain, located 28 km west of Chuxiong city, capital of Chuxiong Yi Autonomous Prefecture, Yunnan province, on the eastern margin of the Himalayan region. The Zixishan Nature Reserve, an area covering 6,700 ha was established in 1982. In addition to conifers and broadleaf forest species, the reserve is home to many rare and endangered species of animals and plants. Zixishan was a religious site historically, so religion and traditional culture play a significant role in the natural resource management of the reserve. It is home to three ethnic groups - the *Yi*, *Miao* and *Han*.

Two communities which live inside the buffer zone of the reserve were selected as the study sites. Small farmers grow rice, their staple food, and they earn a cash income from the sale of fruit and minor forest products to supplement their subsistence crops. The area's history, ethnic cultures, and scenic landscape make Zixishan a place with considerable potential for tourism. But conflicts between development and conservation have been coming to the fore.

In Mr. Long's view, indigenous knowledge, the strengthening of farm-

ers' organisations, and the use of PRA approaches are fruitful in planning sustainable rural development at the village level. He said different methods were used in different research stages for data collection, field survey, and analysis, e.g., by researching available literature; PRA training workshops for farmers, village heads, and representatives from local organisations; questionnaires and interviews supplemented by PRA; ethnobotanical methods and analysis of natural resource management within the conceptual framework of human ecology. After training, workshop participants were treated as investigators/researchers/informants. Farmers, informants, students (including outside investigators) worked together. The selection of persons for interviews was based on age, gender, and social status. Women and men (old, young, educated, and illiterate) were both included.

Mr. Long highlighted three major factors that are hindering rural development and nature reserve conservation in Zixishan - fuelwood shortage (private forestlands cannot meet the demand), lack of fruit tree management techniques (fruit is the principal source of cash income), and animal husbandry (which is affecting the forests negatively). Through project activities, energy-saving stoves have been popularised (482 households out of 484 use these stoves) and both the Zijin and Yunqing communities have established Horticultural Associations for scientific management of fruit trees. He mentioned that musella cultivation and beekeeping, two examples

RESOURCE PERSON *Dr. Leo A. von Geusau is a senior researcher at the Mountain People's Culture and Development, Educational Highland Research Institute (MPCDR-HRI). The MPCDR-HRI was born, rather than "founded" in 1978, in Chiang Mai, as a result of a tribal movement that demanded equal access to modern education and communication with the outside world. Since then it has incorporated Thailand's six major tribal groups*

Tribals uplifting themselves

The Association for the Mountain People's Culture and Development, Educational, Highland Research Institute (MPCDE-HRI) was born, rather than "founded," in Chiang Mai in 1978 as the result of a tribal movement for equal access to modern education and communication with the outside world. Six major tribal groups in Thailand have been incorporated into the association, and the MPCDE Foundation serves as an umbrella for several tribal NGOs.

The aims and goals of MPCDE-HRI are i) to be a service unit, cooperative, and resource centre; ii) to promote cultural studies (practical and future-oriented) by mountain people (action research on traditional knowledge, e.g., ecological, medicinal, nutritional, etc, and support of sustainable responses and adaptations to threats to tribal culture and rights); iii) to promote higher/advanced and vocational studies (older and committed, urbanised tribal students, preferably women) including a leadership-training student programme (matching modern education with a non-formal traditional knowledge curriculum); iv) to foster the mountain people's self-identity by promotion of songs/dances/handicrafts, etc; v) to promote grassroots', action-oriented research by tribal experts; vi) to promote and assist the formation of independent ethnic minority NGOs and centres in the lowlands, including political training and safeguarding; vii) to coordinate common activities and programmes; viii) to assist researchers, media persons, tourists, and others in a guest-programme; and ix) to network with other NGOs for economic self-reliance.

The MPCDE-HRI provides i) information and documentation (RDI) services; ii) a resource library; iii) a clipping service (covering most issues); iv) legal and medical unit services; and v) the MPCDE-HRI guest-programme. The Highland Student and Education Programmes consist of assistance for study matched with a non-formal Working Students' Training Programme and Highland Operational Research on Cultural Education for the Future (GORCEF) to bridge the gap between traditional and modern knowledge. The United Tribal Women (IMWECT) programme, aimed at giving a greater role and voice to tribal women and the quadrangle people's programme which has the objective of common development of the quadrangle area (*S. China, Laos, Kampuchea, Vietnam, and Burma border area*), involving the *Hani/Akka* people. The Participatory Action-Research Unit was established to encourage "grass-roots research about, by, and in the advantage of tribal peoples themselves." The MPCDE-HRI often relies on short-term funding from a variety of foreign agencies and it prefers to match funding with services to create an adequate bilateral relationship.

of indigenous practices, demonstrated the advantage of using PRA as an action research tool. Farmers shared the investigation and PRA results, which increased their participation and cooperation in planning and project implementation. The result was the construction of a base for sustainable rural development.

Dr. Evelyn Mathias-Mundy, of the International Institute of Rural Construction (IRRI), believes that a wide array of methods is available to record IK. They range from anthropological long-term studies to short-term appraisals. There are also "mid-term" studies that draw on both methods. Record-ers have to decide on a case-by-case

basis which combination of methods best fulfills their purpose and subject, Dr. Mathias-Mundy said. In the past, IK recording was dominated by anthropological methods. Later, multidisciplinary approaches such as Rapid Rural Appraisal and, more recently, Participatory Rural Appraisal had become popular. PRA provides a basket of useful techniques, some identical with well-established anthropological methods. Examples include direct observation, the development of seasonal calendars, ranking games, and the reconstruction of local histories. Although the "rapid" methods are not specifically developed to capture technical IK, they have been used successfully to

do so. The participatory methods of PRA often yield valuable information on IK because they involve farmers as actors rather than as respondents. Farm maps drawn by farmers, for example, provide insights into a community's resource classification and use. Mixed approaches have been or could be used to record IK. For example, Mathias-Mundy et al. (1992) combined anthropological and appraisal methods with veterinary diagnostics to assess the ethnoveterinary knowledge of farmers in West Java, Indonesia. Surveys based on structured questionnaires are less suited to capture IK. The "discovery" of new IK requires recorders to be willing and open to techniques/practices that do not conform to patterns they learned to recognise during their studies.

Dr. Mathias-Mundy said that IK is what people do unconsciously and thus reports the ideal situation but the validation of IK had to come from other methods besides direct observation. Building rapport with villagers was crucial. Practices that could be used or recommended had to be identified. She concluded that the communities should have access to the study results to benefit the end-users.

■ Panel B

Indigenous Knowledge Systems (IKS)

The leader of Panel B was Dr. P.S. Ramakrishnan of Jawaharlal Nehru

University; Mr. Long Chun-lin of the Kunming Institute of Botany and Mr. Barun Gurung of SAGUN presented project results; and resource persons were Mr. Yu Xiaogong of the School of Environment, Resources and Development, Asian Institute of Technology, and Mr. Songwit Chuamsakul of MPCDE-HRI.

China

Mr. Long gave a slide presentation to illustrate the IKS of communities residing in the Zicishan Reserve. According to ancient Chinese legend, water and rain are controlled by dragons. The Zixi Mountain is the backbone of the dragon, which does not work unless the mountain forests are well maintained. Therefore, the water source forests in Zixishan are protected by the local communities for the sake of water. Recently, two stone tablets were found that describe in detail how to manage dams, streams, and drains; how to use water in the lower areas so that irrigation is unnecessary; and how to protect water sources and forests in the upper areas.

Traditionally, biodiversity management in Zishixan took the form of worship of holy trees, holy forests, ancient trees and plants in temples, and totems like *mayinhua*, *Rhododendron delavayi*, and the tiger. Mr. Long described the general model of agroforestry in Zixishan as "fruit trees + ground lotus (*Musella lasiocarpa*) + subsistence crops + beekeeping." The major agroforestry systems can be clas-

RESOURCE PERSON *Dr. Evelyn Mathias-Mundy is coordinator for the Regional Programme for the Promotion of Indigenous knowledge in Asia (REPPIKA), which was established in 1990 at the International Institute of Rural Reconstruction in Silang, Cavite, Philippines. The programme was designed to support the efforts of national centres in Asia to record, document, and utilise indigenous knowledge (IK). These centres are linked with the global network by: providing logistic support; facilitating the exchange of information and materials; and fostering collaboration between projects for recording, documents, and dissemination of IK.*

sified into five types and 15 system units. Among them, the most common and traditional type is agro-silvo-bee-keeping, pastoral systems. Pear planting is a common practice; *Pyrus pashia*, a stock species of pear, is found all over Zixishan. Ground lotus (*Musella lasiocarpa*) is an indispensable component of the local agroforestry system. It is a pig fodder, a vegetable, and used for controlling erosion, ornamental purposes, weaving, and wine-making.

The practice of agroforestry is to increase the utilisation of lands, control soil and water erosion, improve soil fertility, reduce the pest population, and improve the fruit quality. The lotus plant is burned in winter when the leaves dry up because faster burning improved crops the following year. Holy trees and forests are central features of *Yi* society; villagers never cut sacred trees. Other traditional practices include the *Yi* adoption of *Rhododen-*

dron delavayi as a totem, the local people's preservation of a 600 year-old *Camellia*, and beekeeping. Bees played an important role in pollinating crops and trees within the system. The bee house is usually made from round wood, the open end of the wood sealed with buffalo manure, leaving a small hole for the bees to enter and exit. Though there are differences between different ethnic groups regarding IK, the indigenous communities have preserved traditional knowledge in one form or another.

Nepal

Mr. Barun Gurung, of SAGUN, gave a presentation on the IKS of the *Mewahang Rai* in Tamku, in the eastern district of Sankhuwasabha. The Rai are a distinct ethnic group who, together with the *Limbu* further east, are known as the *Kiranti* people. The *Mewahang* are a *Rai* subtribe. The gen-

Water Resources' Management

Water is a key factor for human survival. How to manage water resources becomes a part of indigenous knowledge, especially in the region inhabited by the Zijin and Yunqing communities in the Zixishan Reserve, where one of the only two water sources is to be found (the other one is in heaven!). In addition to irrigating the paddy fields and upland terraces, water from the forest of Zixishan is also used for humans and animals. According to an ancient Chinese legend (common to almost everyone), water and rain were controlled by dragons. When it was too rainy or dry, a dragon-worship ceremony would be held throughout a given region. There is a belief that the Zixi Mountain is the backbone of a dragon and is dependent on the gods who control the hills, forests, villages, lands, and water. The mountain is the foundation of the forest and the forest is the source of water. The dragon's backbone does not work unless the forests on the mountain are well maintained. If the forests are destroyed, the water will decrease and drought will occur. Therefore, the forest water sources in Zixishan have been protected, for Dragon worship is common throughout China. In the Zixishan region, dragon worship is manifested in the worship of forests and mountains and is connected with water resource management, as mentioned above. Forests in which the dragon is believed to live are preserved by traditional culture and folk regulations. Four stone tablets describing the relationship between dragons and forests were found in this region. They more or less have been acting as a basis for the rules of forest and biodiversity conservation since they were made 200 years ago.

Indigenous Knowledge of Plant Species

Use	Preference Ranking	No. of Species
Fuelwood	1	56
Fodder	2	84
Ag. Equipment	3	2
Timber	4	9
Fencing	5	9
Ritual	6	11
Rope	7	2
Household Equipment	8	15
Food	9	35
Shade	10	3
Medicine	11	18
Dyes	12	1
Erosion Control	13	16
Poison	14	4
Animal Feed	15	13
Roof	16	2
Manure	17	12
Animal Bedding	18	7
Mulching	19	4
Soap	20	3

eral body of the environmental knowledge of the *Mewahang Rai* ranges from resource classification to extensive utility and management practices. Their exploitative strategies cover a vertical range from 500 metres to 2,100 metres above sea level. They are able to identify over 200 plant species, some with multipurpose uses, e.g., 20 household articles and 12 types of agricultural, hunting, and fishing implements are made of bamboo.

The existing management practices indicate that IK extends to the biological relations between crops and other natural resources and that the knowledge is used effectively. **Erosion control practices consist of preparing bunds - maintaining** long fallow periods with vegetative cover following harvest, ploughing along the slope contour, propagation of species that control erosion, and building fences with live species that are multipurpose in nature.

The *Mewahang* also use manuring and management practices to maintain soil fertility. The *khira* leaf is used to

manage pests in crops. Weed control methods such as burning, flooding (by irrigation), and ploughing before planting (to expose weeds to the sun) are followed. The *Rai* also observe genetic resource and microclimatic management practices. General environmental knowledge and oral rituals are two sources of information for researchers. The utility classification of plant resources demonstrates a fairly elaborate process of selection upon which appropriate behaviour is determined. The *Mewahang* make a distinction between trees, bushes, etc, according to the root structure, shade potential, height, density, location, and elevation.

Rai perceptions of the environment are influenced by the creation myth, a distinct part of the *Muddum* or oral tradition. The creation myth is divided into four parts - origin, differentiation, migration, and creative deeds of the ancestors - starting from the beginning of the world, continuing with the establishment of traditional order, leading to the present condition. The ancestral stone *Sakhewahung*, gives meaning to the concept of *Ca:ri*, or clan territory. Among the *Mewahang*, the *Purkha* (clan elder), *Nokchung* (priest), and the *Bijuwa* (shaman) are three types of ritual specialists. They are knowledge holders (the source of cultural continuity) and bridge the spiritual and mundane aspects of the natural environment.

Ubhauri refers to the traditional upward migration of cattle and people to the higher pastures during the Nepali month of *Phalgun*. The *Ca:ri Puja* is performed by the *Nokchung* to commemorate *Ubhauri*. The *Udhauri* (southward movement of people and cattle from highland pastures) coincides with the end of the monsoons and the beginning of winter. The

Nwagi festival is performed in the *Khamang* or ancestral shrines within individual households to thank the ancestors for protection in the past season. The *sili* or ritual dances that retell the origin myth of the *Rai* are a significant component of *Rai* culture.

Mr. Gurung noted that migratory patterns were traditionally based on ecological factors of seasonal change. For instance, the wildlife migratory patterns and the change of voice in the *Orwo* bird due to a hormonal response to change in daylight hours provide the cue for the migration of people and livestock. Concluding, Mr. Gurung said that development strategies which incorporate the cultural explanation of the human-environmental relationship must be examined for their efficacy in empowering groups such as the *Rai* who live on the economic and political margins of the national mainstream.

Mr. Yu Xiaogong presented a paper on Protected Areas, Traditional Natural Resource Management Systems, and Indigenous Women: A Case Study of Xishuangbanna, China. He began by saying that mal-development has three consequences - destruction of biodiversity, extinction of "other cultures," and deterioration of the "other sex."

In the Xishuangbanna protected area of Yunnan Province, resettlement programmes have a considerable impact on the indigenous communities. The traditional natural resource management systems, IK, and indigenous women's role in natural resource management in *Dai* and *Jino* villages in and around the protected area are the subject of investigation. Findings reveal linkages between cultural diversity, women's role, and biodiversity conservation, Mr. Yu said. In the concerned protected area management system,

cultural bias was found to be a major obstacle to the efforts to conserve natural resources. Co-management was thought to be the best possible solution to protecting the area as well as to improving the socioeconomic conditions of the local people. It was a positive sign to find the staff of the protected area willing to co-manage the area with the local people, Mr. Yu said.

Under analysis, the Traditional Natural Resource Management System (TNRMS) was found to be functioning and proved to be economically, socially, and ecologically sound. The TNRMS principles are: sustainable use of renewable resources, biodiversity conservation, respect for natural processes, multiple use of resources, and lower external cost. Social institutions - community organisation, traditional knowledge system, ideology (social value, norms, co-ethics) and belief (religion, rituals) - interacted with and influenced the resource - use pattern of the people. Indigenous women were found to have a closer relationship with nature because they perform social production and reproductive tasks; any changes in the resource base were found to directly affect women.

In Mr. Yu's view, it is crucial for project area managers and conserva-

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RESOURCE PERSON *Yu Xiao Gang is currently a researcher in Gender and Development Studies, Asian Institute of Technology, Bangkok. He spent eight years researching Yunnan ethnic groups (Dai, Hani) at the Institute of Ethnology, Yunnan Academy of Social Sciences. His interests include indigenous knowledge, natural resource and environment management by local people, protected area and biodiversity conservation, gender and development issues.*

- Use
- Fuelwood
- Fodder
- Ag. Equipment
- Timber
- Fencing
- Ritual
- Religion
- Household Equipment
- Food
- Shade
- Medicine
- Dyes
- Erosion Control
- Fodder
- Animal Feed
- Road
- Manure
- Animal Breeding
- Shading
- Soap

tionists to be clear about conservation, i.e., biodiversity protection depends on empowering local people to make decisions based on their culture and knowledge system. He recommended the following.

—Protected area (PA) authorities should involve indigenous men and women in decision-making and planning.

—The PA authorities should share management power and responsibilities with indigenous representatives.

—Guards should be locally recruited as they are knowledgeable about the local ecosystem and wildlife.

—The traditional natural resources' management system should be evaluated and strengthened.

—A co-management plan should be formulated in terms of goals, objectives, and constraints.

—Traditional techniques for environmental conservation should be recorded and adapted.

—Cultural biases should be removed.

—Resettlement should be a last option after careful study has ruled out other solutions.

—Preservation of the cultural heritage is equally important.

—Social impact studies should be conducted.

—Continuing support is needed for successful resettlement, and the resettlement people should be allowed to maintain certain links with their traditional resource base, e.g., revisiting the sacred forests, etc.

—Further research needs to be un-

dertaken on indigenous cultures having a close relationship with biological conservation. Variables such as social values, beliefs, taboos, myths, rituals, and so forth should be studied. Ethnobotany, ethnobotany, and social science are important fields for research.

—There should be study and monitoring of the changes in the resource use pattern causing changes in the ecosystem and changes in the resource base leading to cultural changes.

—More research is needed on indigenous women's natural resource-use patterns relating to social values, eco-ethics, and productive and reproductive functions, etc.

The leader of the panel, Dr. P. S. Ramakrishnan of Jawaharlal Nehru University, provided an ecological perspective of IKS. In his view, the application of the development paradigm to upland, traditional, often tribal, societies, within an extremely fragile though resource-rich mountain system, had either caused disasters or had not been able to penetrate the community.

Dr. Ramakrishnan said that it was important to catalogue traditional technologies and to improve them by understanding the processes involved. Keystone species were crucial in nutrient recycling during secondary forest succession. Many ecologically significant keystone species were selected by communities through social processes over time. He stressed that linkages between ecological and social processes had to be deciphered and used.

For instance, the natural ecosystem faced internal and external distur-

Hill tribes of Thailand

Eleven tribal groups in Thailand are believed to have migrated from Tibet, Burma, and China. A majority - 85 per cent - of them live in the northern region. From 1980 to 1982, they encountered several problems, including political ones. The government and the mainstream culture have largely ignored the indigenous knowledge systems of the tribes. Though new economic and social plans are formulated every five years, most tribes have not benefitted from them.

Mr. Songwit Chaumsakul of MPCDE-HRI blames the top-down - as opposed to grassroots' - development approach adopted. He stressed the importance of giving people the power to plan and decide for themselves. As they understand the local problems better, their solutions are more likely to be sustainable.

Among these tribes are the *Hmong (Miao)*, believed to have migrated from South China 200 years ago. Of an estimated 8,920,000 *Hmong* in Asia, 95,000 are in Thailand spread over 13 northern provinces. The *Hmong* are divided into two sub-groups - blue and white *Hmong*, denoting their clothing colour and their dialect, which is part of the Sino-Tibetan linguistic group. Believers in spirits, they summon their shamans in times of emergency.

The *Hmong* used to practise shifting cultivation and grew opium as a cash crop until stopped by a United Nations' directive. They cultivate field rice for themselves and maize for their livestock. Since their switch to settled agriculture, they grow a large number of marketable crops. But these changes have been accompanied by problems such as pesticide use, heroin use, the adjustment to a new way of life and culture, and the erosion of traditional beliefs. The *Hmong* have also had to put up with constant military conflict in the area. According to reports, the many who migrated to western countries have experienced problems adjusting.

bances, but *Quercus* species could be used to conserve moisture within the soil sub-system. Biological invaders, e.g., exotic weeds (endemic to Latin American countries) posed a threat. Dr. Ramakrishnan said it was important to reconcile the adverse effects and the useful role of these biological invaders. In terms of human resource development, PAR and PRA were useful, but mere cataloguing of IK was not enough and process-level studies were necessary. Ecologists should consider the linkages between sustainable development, rehabilitation, and other driving forces.

Concluding, Dr. Ramakrishnan said that process-level studies should form the basis of development strategies. He suggested (i) transfer of agricultural technology for *jhum*, valley cropping, or home gardens between tribes to improve ecological/economic efficiencies; (ii) maintenance of a minimal 10-year *jhum* cycle; (iii) strengthening the

agroforestry component of the *jhum* system; (iv) considering animal husbandry and domestic sub-systems as integral parts of the agricultural sub-system; (v) altering crop cultivars based on soil nutrient status and incorporating pisciculture for high economic/ecological efficiency levels in agriculture (*Apatanis* of Arunachal Pradesh follow this practice); (vi) biological lessons and traditional practices should be integrated; (vii) use of keystone species; (viii) soil fertility maintenance based on the recycling of organic residue waste, selection of appropriate crop cultivars, maximising nutrient use efficiency by crop placement patterns, tree architecture, and agroforestry inputs; (ix) 'sacred groves' as a storage of ecological knowledge useful for restoration ecology; and (x) development packages tailor-made to a given ecological situation though based on socioeconomic and cultural understanding.

■ Panel C

Local Organisational Strengthening

The leader of Panel C was Dr. N. Ishwaran of UNESCO's Man and the Biosphere Programme; Mr. Long Chun-lin (KIB) and Mr. Buddhi Tamang of SAGUN presented project findings; and Mr. Pralad Yonzon of Resources' Nepal was the resource person. The theme: Local Organisational Strengthening.

Nepal

Mr. Buddhi Tamang said that, in the past, local youth were organised in the youth organisation (class organisation) of the *Panchayat* era. From 1983 to '89, these organisations became dysfunctional, and most youth members had left the organisation to join the communist party. In the '80s and '90s, some organisations (*Silichong* Club, a sports club) had formed a sheep-rearing group, *Nitkosh* (a grassroots' group concentrating on agriculture), and *Golkhandi* Forest Users' Group.

Mr. Tamang identified the causes of organisational failure during the 15 years as: 1. interference of political organisations; 2. lack of leadership at the community level; 3. inappropriate use of funds for government-sponsored drinking water projects; 4. lack of transparency regarding financial accounts;

and, 5. faulty government approach to institutional development.

The impact of failure was the lack of unity and group feeling, the underdevelopment of organisational mechanisms, the distrust of outsiders, lack of leaders to initiate community development, improper utilisation of natural resources, and improper tapping of available resources and services of GOs and NGOs.

Mr. Tamang said that SAGUN had identified the formal and informal leaders of the local organisations and initiated contacts. According to an informal agreement with *Silichong* Club, SAGUN would undertake activities such as 1. consolidation of the Club through drafting of a new constitution with community development objectives; 2. development of a programme strategy; and 3. formation of sub-branch committees at the VDC level. Grassroots' groups, women's groups, forest users' groups, drinking water users' groups, Arun Cooperative, and *Sagarmatha Janasanskrit Paribas* (SJP) were other groups with whom SAGUN maintained contacts.

The *Silichong* Club formed a culture committee (15 members) for cultural revival, especially of the *Mewachang Rai*. Along with SAGUN the club organised training programmes for a forest nursery, winter crops, record keeping/management, kitchen gardens, village project planning, bamboo crafts, wool knitting, and agricul-

RESOURCE PERSON *As the founder director of the G. B. Pant Institute of Himalayan Environment and Development, Professor Ramakrishnan initiated research projects in Kumaon, Garhwal, the north-eastern hills, and Sikkim, based on a project formulation phase in an initial workshop involving scientists, planners, administrators, and NGO groups from the region. He is currently involved in networking with ecologists on a variety of local, national, regional, and international programmes based upon ecology-socioeconomic, interactions, and his own continuing research efforts on ecological processes/sustainable development related to areas in the north-eastern hills, the Himalayas, and the Western Ghat region in India.*

People and Parks in Nepal

When the Protected Area system was introduced in Nepal with the establishment of the Royal Chitwan National Park (RCNP), the rhino population was nearly decimated. Over time the rhino count reached 400. In 1993, 57,000 tourists visited the park, yielding a revenue of 30 million rupees, out of which 10 million rupees was ploughed back into buffer zone communities. The park had 78 elephants, which needed green fodder each day. The RCNP supported the daily needs of 70,000 people. Although the national park system is not a water-tight compartment, people appear to be able to fulfill their needs from it, if illegally at times.

Problems are inevitable when the household subsistence economy encounters the market economy. In the Langtang National Park, the establishment of the cheese factory prompted villagers to keep more cows. Increasing cattle grazing resulted in decreasing forest cover at the cost of catering to the local cheese market for tourists in Kathmandu. It is evident that economic incentives play an important role in resource management.

tural extension. Mr. Tamang believes a linkage building (with GOs and NGOs) programme is significant in institution building. The task of local institution building is crucial and is accomplished by conducting various types of training, meetings, talk programmes, contacts with individuals, and networking.

Organisational capabilities, however, are built up only through tremendous efforts. The *Silichong* Club and grassroots'/users' groups had enhanced their knowledge and skills and developed self-confidence through mobilisation and management of locally available resources. But existing activities are not sufficient to sustain the groups under the changing circumstances. Therefore, *Silichong* Club and SAGUN have agreed to develop additional training programmes and activities at the micro-level.

Mr. Tamang outlined the following activities for possible implementation in the future - (i) excursion tours (farmer-to-farmer exchanges); (ii) training on development concepts and prevailing practices; (iii) leadership development training; (iv) encouraging women's participation in development; and (vii) further assistance to cultural revival of the *Mewahang Rai*.

Some positive developments are the conversion of Golkand, Mulpani, and Legigurans forests from government to community forests, and the introduction of beneficial agroforestry practices (management of fruit trees) intercropping, cash crop plantation, pest control, livestock improvement, forest management activities, and local craft production.

China

Mr. Long Chun-lin, of KIB, told participants that the Zijin and Yunqing communities had a committee of five to seven representatives, including the village head, co-head, accountant, secretary, women, and youth members, all of whom were elected by the villagers. He said a community committee was the basic unit of village management and was also a bridge connecting local government and the village. The women's association united the women of a village for specific programmes such as health, child care, and birth control. Embroidery and culture were also included in the programmes. Zijin and Yunqing had also formed horticultural associations to introduce and manage fruit production and home gardens. Each association consisted of seven to eight farm-

ers who could read and had mastered some skills. Mr. Long stressed that rural organisations had to be strengthened to achieve rural development. He suggested that farmers' organisations could play the role of instructors, organisers, executive bodies, and management boards. In several respects, local organisations had been strengthened. For example, the training in cultivation and management of fruit trees had improved the ability of horticultural associations. The farmer-to-farmer exchanges in and outside Chuxiong had sharpened the perception of committee members and farmers toward village-level planning and rural development since the project's initiation in 1992.

In the view of Dr. N. Ishwaran, local organisations revolved around 'development' as people could not help being affected by outside influences. There was no alternative for the traditional systems but to bear the impact of the market economy. However, their responses to outside influences depended on the strength and status of the systems. Research on development activities did not reflect on conservation. He reiterated that conservation, research, and development should be linked for local development and biodiversity conservation. He noted that strengthening local organisations also involved strengthening other forms of organisation, e.g., administrative levels.

■ Panel D

Biodiversity Management

The leader of the Panel was Dr. Gary Martin (UNESCO); resource persons were Dr. T.B. Shrestha (IUCN) and Dr. Alton Byers (Project Co-Manager, Makalu Barun CP); Mr. Long Chunlin (KIB) spoke about biodiversity at the project site.

China

Mr. Long spoke of the beliefs of the Yi people and how these dictated their conservation behaviour. The tiger is a totem of the Yi people who are also known as the nationality of the tiger. In Zixishan, the tiger survived until the 1960s; it was protected by the traditional Yi religion. The Yi also worshipped holy trees such as Chinese ilex, oak, *Keteleeria evelyniana*, and other species on special religious festivals. The holy forest behind Longwangmiao village was a burial hill which was conserved by village laws. Such forests provided birds and small mammals with a suitable habitat. The rhododendron was a symbol of the Chuxiong Yi Autonomous Prefecture besides being a Yi totem.

According to Yi legend, the *Mayinghua* flower saved the Yi people from extinction. Forests in which the dragon was believed to live were preserved by cultural and folk tradition.

RESOURCE PERSON *Dr. Natarajan Ishwaran is with the Environmental Sciences' Regional Office for Science and Technology, UNESCO, in Jakarta. His special area is terrestrial ecology, natural resources' management, conservation of biodiversity-with emphasis on management of protected areas-and human resources' development in environmental sciences. He is currently coordinating UNESCO's Jakarta operations on a UNESCO-WWF Joint Project on "Traditional Plant Resource Use by Indigenous People in the Kayan-Mentarang National Park, Kalimantan, Indonesia." He is also coordinating the UNESCO inputs in traditional forest resource ownership and use and their impacts on biodiversity conservation in PNG.*

People and Plants' Initiative

Begun in July 1992 as part of the Man and the Biosphere Programme (MAB), the People and Plants Initiative is a joint effort of the WWF, UNESCO, and the Royal Botanical Gardens, Kew. It focuses on field activities in biosphere reserves, World Heritage sites, and other natural areas in which partner organisations have been active. The key objective of the People and Plants' Initiative is to support the work of ethnobotanists in developing countries on the use and sustainable harvesting of plant resources as well as on the application of the results of research in conservation and community development. Training workshops are held for participants on ethnobotanical methods drawn from various academic disciplines. At the sites of field projects, People and Plants' coordinators, with local people, park personnel, and researchers, prepare inventories of useful plants and appraise the effects of harvesting specific plant resources in and around the protected areas. Scientific and popular literature, as well as practical method manuals on ethnobotany, resources' harvesting, and other related topics, were also distributed.

People and Plants are carrying out projects in Kinabalu Park (a protected area in Sabah, Malaysia), Beni Biosphere Reserve (northern Bolivia), northern Sierra (Oaxacastate) in Mexico, and Mixe (indigenous town of Totontepec). Though all have diverse cultural and natural areas, they share a common approach to ethnobotanical exploration in protected areas. The emphasis is on reinforcing subsistence use and small-scale commercialisation of plants that contribute to the well-being of rural communities, enhancing their capacity to participate in conservation efforts.

All work is carried out by teams of local people, park personnel, researchers, and university students to build up local expertise in ethnobotany and to reinforce interaction between communities, national scientific institutions, non-government organisations, and conservation agencies.

Four stone tablets from 200 years back relate the relationship between the dragon and forests. Gods and holy beings are believed to live in ancient trees, which were left alone to let the deities to die naturally. Thus forests surrounding temples and nunneries in Zixishan were preserved out of religious piety.

Dr. T.B. Shrestha of IUCN noted that indigenous knowledge is based on nature. Nepali villagers believe the cuckoo bird sings 'kaphal pakyo' - "the Kaphal fruit is ripe" - and the 'biu biu' cry of another bird is a warning that seeds are rotting. The rural lifestyle follows the rhythm of nature, and hu-

man beings are seen to be part of nature, i.e., in their perception of a microcosm in a macrocosm. In Jumla, if a son who left the village in search of employment or on another purpose does not arrive for rice plantation by a certain date, he is presumed dead. This is because the plantation period in Jumla is extremely short and delay is critical.

Citing other practices of indigenous knowledge, Dr Shrestha said that some villagers observe body temperature to initiate rice germination; others use the head of the shrike bird in the first rice-feeding ceremony. In the *bel* marriage ceremony, the wild *bel* fruit

RESOURCE PERSON *Dr. Tirtha Bahadur Shrestha is a plant ecologist who has spent 25 years in plant collection and botanical research in the Nepal Himalayas. Presently he is the programme coordinator for the Heritage and Biodiversity Conservation Programme of the IUCN. Prior to this, Dr. Shrestha was the task force coordinator for the Woodlands Mountain Institute's Mahalu-Barun Conservation Project. His Senior Research Fellowship at ICIMOD resulted in a study of the Development Ecology of the Arun River Basin in Nepal. He was affiliated with Nepal's Department of Forestry and Plant Research for 31 years.*

RESOURCE PERSON *Dr. Alton C. Byers is a representative of the Woodlands Mountain Institute, U. S. A. The Makalu-Barun National Park and Conservation Area, the eighth established in Nepal (in 1991), is designed to protect 1,500 sq. km. of virtually uninhabited wilderness and includes Nepal's first Strict Nature Reserve in the pristine Barun valley. The 830 sq. km. Conservation Area south and southeast of the Park is designed to encourage its 32,000 residents to become actively involved in biodiversity protection, cultural conservation, and joint parks/people management systems.*

is used. The *Newari* ceremony for a person who has reached 77 years, 7 months, and 7 days' old calls for 80 plant species. The linkage between cultural and natural survival is evident from the numerous natural items required in cultural ceremonies. There are religious forests all over Nepal; sometimes, they are the only source of indigenous plant seeds. Buddhists speak of hidden valleys where monks and priests hide during times of upheaval and where sacred texts are hidden and preserved. About 18 such valleys have been identified. Unregulated collection of medicinal plants for commercial purposes, however, threatens the survival of many indigenous plants.

In the Makalu-Barun area, slash-and-burn cultivation is practised. Bears are killed for their gall bladders (which are believed to have curative properties and have commercial value) and meat (for protein). It is said tourism is Nepal's third religion, after Hinduism and Buddhism. Given these vast changes, there is more reason to pre-

serve indigenous knowledge.

Referring to the Makalu-Barun Conservation Project (MBCP), Dr. A. Byers, Woodlands Mountain Institute (WMI), said that management-oriented research programmes were designed to promote biodiversity conservation within the National Park and in the Conservation Area. To minimise conflicts between people and the park (resource use versus wildlife), innovative buffer zone models have been developed which need to be field-tested, for which core funding is essential.

Wildlife crop depredation, threats to human safety, effect on local income from crop loss caused by animals, and compensation are issues that are not yet well documented. Each park requires on-site specific investigation. Fencing, increased production of natural food sources within the park (*Chital* deer in Chitwan National Park), the planting of crops that do not attract wildlife, keeping larger dogs to discourage wolves and wild dogs, and controlled harvesting are some options. Dr. Byers said substantially increased international funding is required to actually implement the already sound park/people models available.

Dr. Byers believes traditional land use and innovative habitat manipulation are the key to biodiversity conservation. According to an ecologist doing research in the Makalu-Barun Park, certain ground warblers are good indicator species as they nest on or near the floor of the oak/chestnut forests

Use has to be made of local experts, hunters (Shikari), and it is crucial that the younger generation do not lose IK skills.

of Chitre. According to studies, the provision of adequate nesting habitats can be made possible without disrupting traditional grazing patterns and/or imposition of other restrictions. Hands-on training should be provided to local people in biodiversity conservation techniques; these are useful in user group management planning. Approximately nine months' training is required for a local person working with a researcher. Motivation and flexible management are essential; education enhances villagers' receptivity to change. Cultural conservation is an important dimension of nature conservation.

Use has to be made of local experts, including hunters (*shikari*), and it is crucial that the younger generation do not lose IK skills. Given the difficulty of conveying the purpose of the project to the local people, it would be ideal to combine traditional land-use systems, with which villagers are familiar, with innovative research models.

In concluding, Dr. Byers identified the following as important considerations: park-and-people conflicts; the funding roles and requirements; the application of IK and the involvement of the local people and, where traditional land-use systems and innovative habitat manipulation/restoration techniques were concerned, the role of innovative research models and project management strategies; use of traditional plant and wildlife knowledge and skills as educational tools; motivated and trained staff; and sufficient funding.

Discussion

Panel leader Dr. Gary Martin observed that keystone species and the species identified as important by the local people are often similar. In his

view, IK is more holistic than the scientific framework of reductionism, and he congratulated ICIMOD on its interdisciplinary approach. The gender, age, and level of education should be taken into account. It is necessary to close the gap between knowledge and the use of knowledge in development.

Questions and Discussion

Dr. A. Byers noted that agricultural lands and forests often border one another and this interface results in conflicts.

Dr. Sukumar suggested that park-people conflicts can be resolved only through consensus between the local people and the authorities,

Dr. Ishwaran said solutions had to be site-specific.

Dr. Gary Martin pointed out that there is no statistical difference between what the adults and children know in Mexico; he said the body of IK is growing in some places. The documentation of oral knowledge in text books sometimes endangers the body of IK because an 'outside' view can inadvertently include certain classifications and systems. Oral systems are vulnerable and it is possible for IK to disappear in a generation or two. In his view, this is a critical issue and efforts are necessary to ensure that IK is not lost from the community or region.

IK catalogued can be subject to outside commercial exploitation. Of the two, cultural diversity is far more vulnerable than biological diversity to outside influences.

Species that are socially significant to local people often have ecological significance too. Keystone species are often protected by indigenous communities.

Dr. Ishwaran warned that IK catalogued can be subject to outside commercial exploitation. It is crucial to formulate and enforce a biodiversity policy, Dr. Gary Martin said. Noting the linkage between cultural diversity and biological diversity, Dr. Campbell said, of the two, cultural diversity is far more vulnerable to outside influences. He said that other than documentation, techniques to preserve cultural diversity had not been developed.

But it is necessary for the community itself to recognise the value of IK, stressed Dr. Mathias-Mundy. She said IK had been documented in Bolivia, but from the point of view of the local communities, a tropical rainforest once lost cannot be recreated.

Language is a powerful means of recapturing IK, Dr. Campbell said. With the loss of language, the local categories too are lost. Dr. G. Martin believed emphasis should be laid on ensuring the survival of a tradition that is alive rather than recreating something already lost.

Mr. Francis Childe (UNESCO) said no culture can exist in isolation; its own population pressure would de-

mand that old rules and teachings change. New responses are needed for fast-changing conditions. He said scientific methods and traditions should be brought together and local people themselves should be engaged in the process of action-oriented research. Consideration should be given to the linkage between cultural and biological diversity, he added, and cited the example of Laos, Burma, Thailand, Vietnam, China, and the Cambodian border areas, all of which shared a similar culture and ecology.

Dr. Ramakrishnan observed that species that are socially significant to local people often have ecological significance too. In sacred groves, the important species are preserved. Keystone species are often protected by the indigenous communities. Therefore, scientists could benefit from looking into traditional practices as they had evolved over time and as their suitability had won acceptance.

In concluding, Mr Pelinck said cultural and IK systems are dynamic in nature. Reiterating ICIMOD's commitment to IK and biodiversity conservation, he said ICIMOD is interested in continuity, development of alternative concepts and paradigms, and partnerships with like-minded institutions. It is necessary to use indigenous knowledge for development, Mr Pelinck said. A range of options can be developed for the best use of both IK and external (scientific) knowledge. Therefore, future contacts and follow-up programmes are necessary. He said he hoped the exchange of views from different parts of the Hindu Kush-Himalayan Region and from those outside had been beneficial.

Cultural Context of the Natural Resource Management Project-under the UNESCO World Decade for Cultural Development Programme

In the last three to four years, social scientists, NGO workers, and village leaders in Southeast Asia have rethought the idea of development and turned again to traditional knowledge systems in order to understand natural resource management. Consider the successful projects that integrate traditional knowledge into natural resource management projects such as the community forestry projects in India and Thailand and the coastal resource management projects in the Philippines and Thailand. Other development projects integrating traditional knowledge have focussed on Participatory Action Research (PAR) and people - centred development projects.

The purpose of the project activities is, ultimately, to promote better understanding of the cultural context of resource management among academics and NGO workers in six mainland Southeast Asian countries: China, Thailand, Laos, Vietnam, Cambodia, and Myanmar. Participants will learn from each other by exchanging experiences, attending study tours, and conducting case studies. In the long term, the proposed activities would encourage the formation of a network of like-minded researchers actively involved in the development process and interested in the cultural context of resource management.



J. GURUNG

Preserving cultural traditions in Bhutan

Planning Session
future programmes for biodiversity management



MUKTI LAMA

A planning meeting in Tamku-Makalu Barun Conservation area

The third and final day of the seminar was devoted to planning for future programmes for biodiversity management in the Eastern Himalayas. Initially, there was a lot of discussion on the use of the term "trans-boundary" in relation to conservation areas and plans, but soon it became clear that the major interest of the participants was the identification of opportunities for cooperation and coordination among the countries of the region to establish conservation programmes across similar biospheres in neighbouring countries. There was a general consensus that international cooperation is necessary for biodiversity conservation, especially in the eastern Himalayas.

It was noted that many international treaties exist but implementation is needed. What was needed was examples of international involvement in the management of parks. Scientists from different countries had been cooperating for many years although they still had to work out specific areas of cooperation (in livestock, tourism) and the bases for working relationships between park managers and scientists for effective conservation.

An emphasis on practical management and technical cooperation was needed, especially as most of the countries involved shared ethnic communities, particularly in potential conservation areas. It is important to consider the needs and sensitivities of all parties involved.

In this respect NGOs have a great role to play as some issues can be resolved by them. NGOs have a special faculty for encouraging participation and cooperation. Technical cooperation can lead to the resolution of many long-standing problems.

It was thought that it was important to ensure that all parties had an

equal voice. Coordination and cooperation worked best among peers who respect each other on an equal basis, especially as the Eastern Himalayan ecosystem covers a vast area and conservation is no easy task.

The accent should be on international cooperation. CITES and the Migratory Species' Convention are two instruments for cooperation that can prove useful. Everyone should get down to specifics and start the cooperation process on selected items through technical agencies directly responsible for managing the areas. It was stated that the concerned NGOs should have presence and credibility in the area (e.g., Manas-WWF Bhutan). Bilateral cooperation has proved successful. India and China signed a treaty in 1984 on migratory species of birds (303 approx. were listed).

One of the participants noted that the QNP was established five years ago and is recognised as one of the national/State nature reserves. The protected areas in Tibet border Nepal and Bhutan and contact had been established with the Makalu-Barun project staff.

Poaching was discussed as one problem that is solved through International cooperation.

The problems are common although approaches differ was another observation. Like-minded people should meet more often for informal exchange on methodologies, and agencies should work toward positive changes on the ground.

*NGOs have a special
facility for encouraging
participation and
cooperation*

Technical cooperation can lead to the resolution of many long-standing issues.

International agencies, such as UNESCO, could be involved in joint programmes to encourage action research and implementation. Under thematic-comparative studies there could be greater academic cooperation, and common themes could be identified for parallel programme implementation in different countries. A programme of human resource development would be a good idea. Endangered areas could be identified as case studies for broader generalisation of the region as a whole. For instance, the North-eastern region of India and Chiang Mai in Thailand share common problems, issues, and approaches.

The areas of least knowledge should be identified (areas inaccessible to field research) to fill knowledge gaps.

There are opportunities for bilateral cooperation between Nepal and India, which have adjacent areas with similar conditions. In the mid-60s, a barrage was built on the border. The Koshi Tapu Wildlife Reserve is located 22 km from the barrage where the last remnant population (approx. 100) of wild buffaloes was found. The volume of water accumulation on the site (including inundation by floods) has created a unique habitat for water species. People from both India and Nepal bring cattle (domestic buffaloes) to the reserve for mating with the wild buffaloes to improve the genetic stock. Dr. Yonzon felt this area afforded an opportunity for INGOs such as WWF-India to cooperate with others in Nepal.

One participant suggested that Nepali and Tibetan villagers could gain

from exchanging ideas regarding protection and conservation as those inhabiting the border areas spoke the same language. Specific problems could be addressed. He said an information network would facilitate the timely tackling of conservation problems.

It was mentioned that the ecological boundary of the Eastern Himalayas had brought participants to a common forum in which the key words were cooperation and coordination. Policies, methodologies, comparative studies, and a biodiversity database are vital concerns. The needs of biodiversity protection had to be linked to existing protected areas and other areas could be included for future inter-country conservation.

A view was expressed that research and management methodologies should be identified through international collaboration, e.g., inventory of species in established PAs, training, database building, etc. The IK of local people had to be used to help biodiversity conservation. It is believed that ICIMOD is a suitable institution to collaborate with in setting up a database for the HKH Region.

What is important is to get down to the nitty-gritty details. One or two common methodologies have to be identified, the results shared on exchange visits, and methodologies modified in accordance with on-site requirements.

Noting that governments alone cannot be responsible for conserving

The areas of least knowledge should be identified to fill knowledge gaps

biodiversity, the QNP was cited as a model for other areas.

A bottom-up approach, e.g., exchanges between wardens, collaborative research efforts, and information exchange, is appropriate for conservation. While governments have to be involved at the central level, it is necessary to start from the field level.

Another view stated was that research should be synergistic and linked to management, and both these linked to the ground realities. It was stressed that on-ground programmes, linkages (networking), as well as site-specific linkage building in the region, e.g., the link between ICIMOD and Woodlands M.I., are extremely important.

The grassroots' representatives should promote exchange visits. Perhaps money from the grant could be allocated for travel every six months. UNESCO encouraged "Apprentice Programmes" and noted that inter-government and researcher interaction is useful, including programmes for technicians/park naturalists.

Although securing permission for programmes/projects can be difficult, and persons selected might not always be suitable for the exchange, regional organisations can play a positive role in this respect.

It was noted that the difficulties of research, such as the prevalence of different languages/dialects in the research area and the reluctance of local people to talk with officials and university professors, have to be surmounted. A team of tribal researchers - partly university students and partly villagers themselves (who are familiar with the local language and customs) - would be more effective in eliciting information through informal friendly discussions and without questionnaires.

One participant spoke of the need for an accessible organisation - not

merely of experts - with a holistic approach that encompassed a wide range of issues, called for an international network, taking cultural aspects into consideration.

The first step is scientific cooperation, it was stated, adding that international agencies can also participate in the process.

It was noted that many conservation areas are characterised by cultural diversity but the people who inhabit them are often marginalised. The real difficulty lies in gaining access to the people who have IK. In such instances, credible NGOs can play a role.

The Myanmar Government's interest in collaborating with ICIMOD member countries was mentioned. Eight counties in the north had been designated as project areas for international cooperation, potentially with ICIMOD. Because the rains lasted for 11 months, the area was not easily accessible. Three national protected areas had already been established. The Myanmar Government was keen on human resource development projects.

One participant had visited Myanmar on behalf of IUCN, he met government officials, and visited a National Park near the Indian border. At the lower administrative levels, people were enthusiastic for funds and training. IUCN, the Wildlife Conservation Society, and the Smithsonian Institution had established contacts. There was a proposal to survey at least 50 per

Research should be synergistic and linked to management, and both these linked to the ground realities.

Many conservation areas are characterised by cultural diversity but the people who inhabit them are often marginalised

cent of the forest area, primarily for elephants and, secondarily, to set up PAs or a network of protected areas.

Finally, it was observed that discussion had focussed on concepts and networking, whereas most projects face resource constraints. Still, many good ideas had been generated by participants. Perhaps funds can be dispersed for individual or regional activities as

additional investment is needed, it was stated. Given that ICIMOD's primary mandate is to document and exchange information, on methodologies for example, it was stated that ICIMOD is willing to cooperate with the MacArthur Foundation or other organisations. An appeal was made to all institutions, including those based in the US, to discuss funding for deserving projects and programmes.

Field Trip

The day concluded with a visit to ICIMOD for a briefing on the organisation's programmes in the Hindu Kush-Kimalayas, followed by a field visit to Godavari, site of ICIMOD's trials and demonstrations for agroforestry and erosion control practices.

*Policies, methodologies, comparative studies, and a biodiversity database are vital concerns
..... the ecological boundaries of the Eastern Himalayas had brought participants to a common forum in which the key words were cooperation and coordination.*

Appendices



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Agenda of the MacArthur-ICIMOD Seminar

April 13 - 15, 1994
Kathmandu, Nepal

TUESDAY, APRIL 12

Arrival of the participants

6:30 - 9.00 pm

Welcoming dinner at Vajra

Hotel. Informal welcome by: Dan M. Martin,
Director of World Environment and Resources
Programme, MacArthur Foundation

Conservation Awareness, Nepal International
Centre for Integrated Mountain Development -
ICIMOD Woodlands' Mountain Institute, USA,
King Mahendra Trust for Nature Conservation

11.45 - 12.00 noon

Questions and Discussion

12.00 - 1.00 pm

LUNCH BREAK

WEDNESDAY, APRIL 13

8.30 - 9.00 am

Registration

A 10-to-15 minute presentation by grantees,
followed by discussion. At the end of the
sessions, a general discussion on the issues
raised in the presentations.

9.00 - 9.15 am

Opening remarks by Dan M. Martin

Sri Lanka & India

1.00 - 2:00 pm

University of Peradenya,

Indian Institute of Sciences,

Mangalore University,

Tata Energy Research Institute,

World Wildlife Fund India,

Centre for Science and Environment

2.00 - 2.15 pm

Questions and Discussion

Bhutan

9.15 - 10.15 am

Bhutan Department of Forestry, Wildlife, and
Conservation Department. Bhutan Royal Society
for the Protection of Nature, World Wildlife
Fund, USA

10.15 - 10.30 am

Questions and Discussion

10.30 - 10.45 am

TEA BREAK

China

2.15 - 3.00 pm

Endangered Species' Scientific Commission,
Chinese Academy of Sciences, Wildlife Conser-
vation Society, USA, Xishuangbanna Tropical
Botanical Garden, Yunnan Provincial Forestry
Bureau

3.00 - 3.15 pm

Questions and Discussion

3.15 - 3.30 pm

TEA BREAK

Nepal

10.45 - 11.45 am

Department of National Parks & Wildlife
Conservation, Nepal Environmental Camp for

3.30 - 4.30 pm

General discussion on grantees' presentations

4.30 - 6.30 pm

BREAK

6.30 - 9.00 pm

RECEPTION AND DINNER hosted by ICIMOD
at Hotel Vajra

THURSDAY, APRIL, 14

8.30 - 9.30 am

Opening of the Workshop on Indigenous
Knowledge Systems and Biodiversity Manage-
ment

Welcome by:

- Egbert Pelinck, Director General, ICIMOD

Introduction

- Indigenous Knowledge of the Mountain
People and Conservation of Biodiversity in the
Mountain Ecosystems by Pei Shengji

- Indigenous Knowledge Systems: Consider-
ations for Development by Jeannette D. Gurung

9.30 - 10.00 am

TEA BREAK

10.00 - 1.00 pm

Project experiences and panel discussion

A. Methodologies

Leader: Evelyn Mathias Mundy

Members: Leo von Geusau, Long Chun-lin
(KIB), Mukta Lama (SAGUN)

B. Indigenous Knowledge Systems

Leader: P.S.Ramakrishnan

Members: Yu Xioagong, Songwit Chuamsakul,
Long Chun-lin (KIB), Barun Gurung (SAGUN)

C. Local Organisational Strengthening

Leader: N. Ishwaran

Members: Pralad Yonzon, Long Chun-lin
(KIB), Buddhi Tamang (SAGUN)

D. Biodiversity Management

Leader: Gary Martin

Members: T. B. Shrestha, Alton Byers, Long
Chun-lin (KIB)

1.00 - 2.00 pm

LUNCH BREAK

2.00 - 4.00 pm

Sessions of the working groups:

A. Methodologies

B. Indigenous Knowledge Systems

C. Local Organisational Strengthening

D. Biodiversity Management

4.00 - 4.15 pm

TEA BREAK

4.15 - 5.00 pm

**Plenary session: presentations by the working
groups**

5.00 - 6.00 pm

FREE TIME

6.00 - 7.00 pm

Wrap-up and concluding session

FRIDAY, APRIL 15

Trans-Boundary and Inter-Country Conservation

9.00 - 11.00 am

*Planning Session on Trans-boundary and Inter-
Country Conservation Programmes in the Eastern
Himalayas by MacArthur Foundation*

11.00 - 11:15 am

TEA BREAK

11:15 - 12:30 am

Continuation of Planning Session

12.30 - 1.00 pm

Transfer to ICIMOD.

1.00 - 2.00 pm

LUNCH at the ICIMOD guesthouse and visit to
ICIMOD

2.00 - 2.30 pm

ICIMOD Briefing

2.30 - 4.30 pm

FIELD TRIP to Godavari

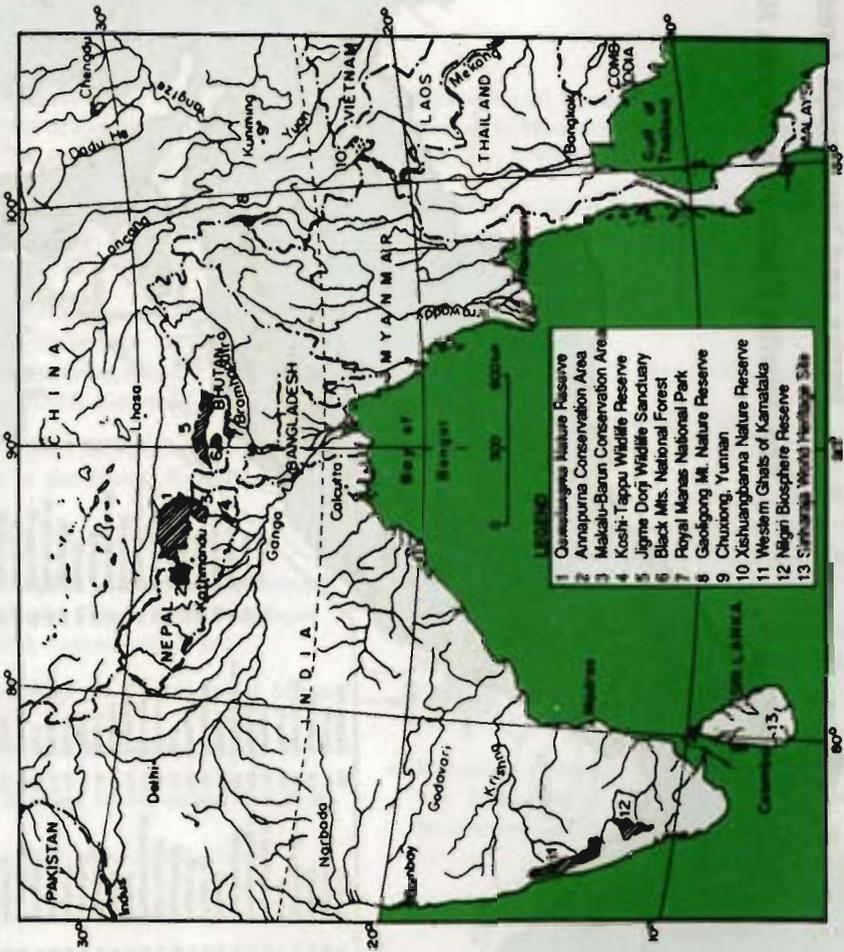
6.30 - 8.30 pm

Reception by WWF Nepal
Programme, Hotel Soaltee

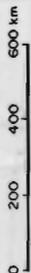
SATURDAY, APRIL 16

Departure of participants

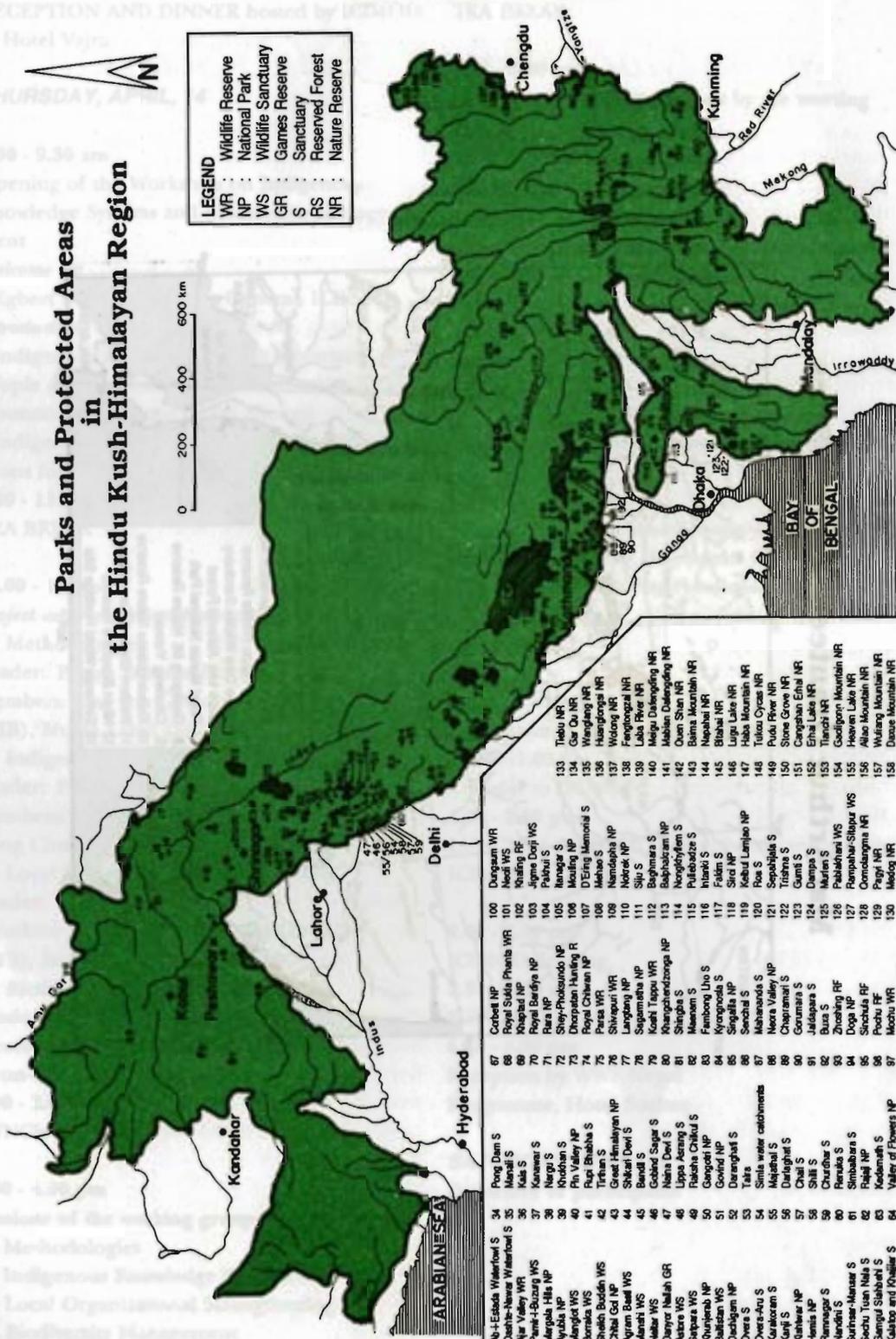
MacArthur Grantees' Project Sites



Parks and Protected Areas in the Hindu Kush-Himalayan Region



LEGEND	
WR	: Wildlife Reserve
NP	: National Park
WS	: Wildlife Sanctuary
GR	: Games Reserve
S	: Sanctuary
RS	: Reserved Forest
NR	: Nature Reserve



1	Ab-i-Esbiya Waterfall S	34
2	Dastar-Nareza Waterfall S	35
3	Air Valley WR	36
4	Pinde-Shuzung WS	37
5	Mergol Hills NP	38
6	Ayazik WS	39
7	Borobud WS	40
8	Shah Wali Wali S	41
9	Shah Wali Wali WS	42
10	Chal God NP	43
11	Agram Basil WS	44
12	Nakar WS	45
13	Daryol Nakh GR	46
14	Astare WS	47
15	Saipara WS	48
16	Khujerab NP	49
17	Balkhan WS	50
18	Duchagan NP	51
19	Ovra S	52
20	Ovra-Aru S	53
21	Korazum S	54
22	Korazum S	55
23	Korazum S	56
24	Korazum S	57
25	Heris NP	58
26	Remogor S	59
27	Nardisi S	60
28	Sarman-Manar S	61
29	Sochu Tuon Nala S	62
30	Gangol Shabahi S	63
31	Kalabog and Dhalig S	64
32	Tundah S	65
33	Kugli S	66
67	Pong Dam S	67
68	Minali S	68
69	Khaprad NP	69
70	Royal Barfya NP	70
71	Shra NP	71
72	Shra-Nakanda NP	72
73	Dharmabandhan R	73
74	Royal Chhuan NP	74
75	Prava WR	75
76	Shwezu WR	76
77	Langong NP	77
78	Sagomtha NP	78
79	Koshi Tapu WR	79
80	Khangchendzonga NP	80
81	Shingba S	81
82	Manam S	82
83	Fambong Lho S	83
84	Shingba NP	84
85	Sachid S	85
86	Maharona S	86
87	Shra Valley NP	87
88	Shingba S	88
89	Gompa S	89
90	Gompa S	90
91	Jalilana S	91
92	Busa S	92
93	Zhoshing RF	93
94	Doga NP	94
95	Shichu RF	95
96	Pochu RF	96
97	Mochu WR	97
98	Royal Manas NP	98
99	Shumar WR	99
100	Dangnam WR	100
101	Koshi WS	101
102	Kinang RF	102
103	Phuola WS	103
104	Phuola S	104
105	Kanaga S	105
106	Mouling NP	106
107	D'Ering Memorial S	107
108	Mehao S	108
109	Namdaha NP	109
110	Nokrek NP	110
111	Silu S	111
112	Baghmara S	112
113	Balpakram NP	113
114	Nongphlyem S	114
115	Pulubatez S	115
116	Initaki S	116
117	Fakem S	117
118	Sirai NP	118
119	Selud Lamjao NP	119
120	Rok S	120
121	Pulou Cycas NP	121
122	Sripahle S	122
123	Gumti S	123
124	Dempas S	124
125	Marian S	125
126	Pabbahant WS	126
127	Rampahar-Shidou WS	127
128	Omchabanga NP	128
129	Pagyi NP	129
130	Medog NP	130
131	Gang NP	131
132	Zayu NP	132
133	Tidku NP	133
134	Sar Chu NP	134
135	Wangdang NP	135
136	Wangdang NP	136
137	Wangdang NP	137
138	Fengogang NP	138
139	Labu River NP	139
140	Meigu Dalengding NP	140
141	Makhan Dalengding NP	141
142	Ouen Shan NP	142
143	Baima Mountain NP	143
144	Nepahel NP	144
145	Bibahat NP	145
146	Luga Lake NP	146
147	Hida Mountain NP	147
148	Pulou Cycas NP	148
149	Shra NP	149
150	Shra NP	150
151	Shra NP	151
152	Ehal Lake NP	152
153	Tianzhi NP	153
154	Godigonn Mountain NP	154
155	Heaven Lake NP	155
156	Aliao Mountain NP	156
157	Wuliang Mountain NP	157
158	Daxue Mountain NP	158
159	Tongshuan NP	159
160	Dailin Mountain NP	160

Compiled from data available in "Nature Reserves of the Himalaya and Mountains of Central Asia", IUCN, 1983, U.K.

ICIMOD Workshop Series

The International Centre for Integrated Mountain Development began professional activities in September 1984. The primary concern of the Centre is to search for more effective development responses to promote the sustained well-being of mountain people. One of the continuing activities of ICIMOD is to review development and environmental management experiences in the Hindu Kush-Himalayan Region. Accordingly, International Workshops are organised in major fields to review the state of knowledge and practical experiences and also to provide opportunities for the exchange of professional expertise concerning integrated mountain development. The reports published in this series are given below.

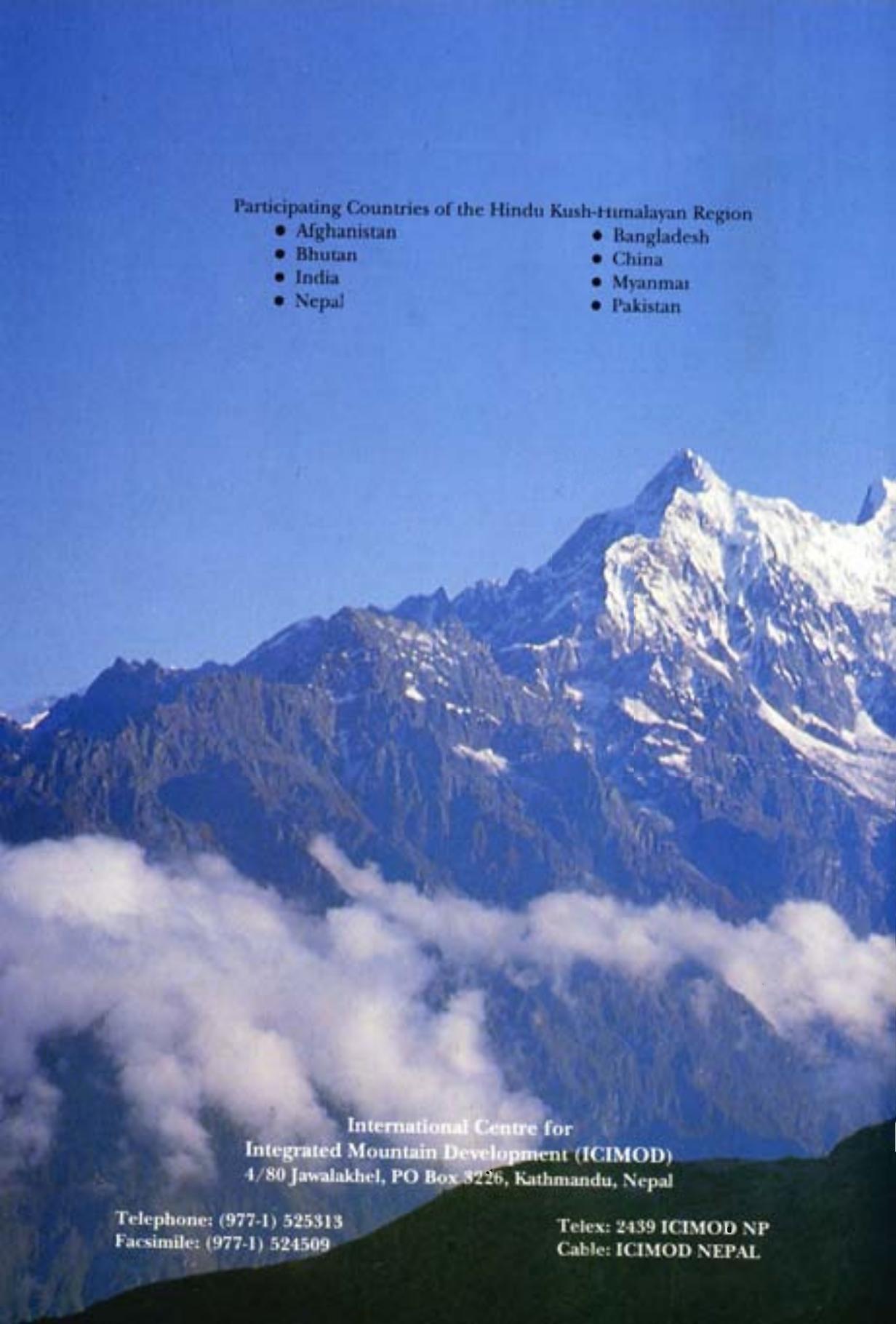
- **International Workshop on Off-farm Employment Generation in the Hindu Kush-Himalaya**
17-19 May, 1986, Dehra Dun, India
- **International Workshop on Mountain Agriculture and Crop Genetic Resources**
16-19 February, 1987, Kathmandu, Nepal
- **International Workshop on Women, Development, and Mountain Resources: Approaches to Internalising Gender Perspectives**
21-24 November, 1988, Kathmandu, Nepal
- **International Expert Meeting on Horticultural Development in the Hindu Kush-Himalayan Region**
19-21 June, 1989, Kathmandu, Nepal
- **International Expert Meeting on Apicultural Development in the Hindu Kush-Himalayas**
21-21 June, 1989, Kathmandu, Nepal
- **Regional Workshop on Hydrology of Mountainous Areas**
11-15 December, 1989, Kathmandu, Nepal
- **Consultative Meeting on Mountain Risk Engineering**
20-22 February, 1990, Kathmandu, Nepal
- **International Workshop on the Role of Institutions in Mountain Resource Management**
1-4 May, 1990, Quetta, Baluchistan, Pakistan
- **Seminar on Rural Energy and Related Technologies in Nepal**
26-28, March, 1991, Kathmandu, Nepal
- **International Workshop on Mountain Off-farm Employment**
17-20 February, 1992, Kathmandu, Nepal
- **Inspirations in Community Forestry**
1-4, June, 1992, Kathmandu, Nepal
- **ICIMOD Methodology Workshop on Rehabilitation of Degraded Lands in Mountain Ecosystems of the Hindu Kush-Himalayan Region**
May 29 - June 3, 1993, Kathmandu, Nepal.
- **International Workshop on Institutional Strengthening for Sustainable Mountain Agriculture**
July 28-30, 1993, Kathmandu, Nepal
- **Remote Sensing Applications to the Planning and Management of Environment, Natural Resources, and Physical Infrastructure**
October 10 - November 6, 1993, Kathmandu, Nepal

These Workshops were attended by experts from the countries of the Region, in addition to concerned professionals and representatives of international agencies. A large number of professional papers and research studies were presented and discussed in detail.

Workshop Reports are intended to represent the discussions and conclusions reached at the Workshop and do not necessarily reflect the views of ICIMOD or other participating institutions.

Copies of the reports are available upon request from:

The Publications' Unit
International Centre for Integrated Mountain Development (ICIMOD)
G.P.O. Box 3226
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- Afghanistan
- Bhutan
- India
- Nepal
- Bangladesh
- China
- Myanmar
- Pakistan

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