SHARING LOCAL AND NATIONAL EXPERIENCE IN CONSERVATION OF MEDICINAL AND AROMATIC PLANTS IN SOUTH ASIA

Nirmal Bhattarai
Madhav Karki

IDRC CRDI

MAPPA

Proceedings of the Regional workshop held at Pokhara, Nepal, 21-23 January 2001

Canada
SHARING LOCAL AND NATIONAL EXPERIENCE IN CONSERVATION OF MEDICINAL AND AROMATIC PLANTS IN SOUTH ASIA

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Editors
Nirmal Bhattarai
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October 2002
Ministry of Forest and Soil Conservation (MFSC) is the principal agency assigned with the policy-making, project implementation, forest resource management and coordination tasks of the Government of Nepal in the field of forest and related natural resources. It has five functional departments separately for forest, soil conservation, research, wildlife and plant resources and a number of corporations. The ministry has recently set up a National NTFP and Jadibuti Development Committee under the chairmanship of the Minister with members representing all the major stakeholders which will set policies, coordinate research and development activities and carry out, and bring various partners together for achieving the goal of sustainable use of medicinal and NTFP resources. The secretariat of the committee is located in the Department of Plant Resources of the MFSC with which MAPPA plans to work in future.

IDRC CRDI

The International Development Research Centre (IDRC) is a public corporation established by the Parliament of Canada in 1970. The Centre was created to help communities in the developing world find practical solutions to the social, economic, and environmental problems they face. Support is directed toward broadening local knowledge and capacity to enable communities to build healthier, more equitable, and more prosperous societies. IDRC supports innovations within South - creative, effective, long-term solutions to development problems that work in local conditions. In doing so, IDRC also strengthens the overall capability of research institutions to generate policies and technologies that can help create more equitable societies. The Government of Canada finances IDRC; its policies are however set by an international Board of Governors. The Centre's headquarter is located in Ottawa, Canada. There are six regional offices located in Africa, Asia and Latin America.

MAPPA

The Medicinal and Aromatic Plants Program in Asia (MAPPA) is a program of strategic research, networking and collaboration to comprehensively address critical research issues related to the sustainable and equitable use of medicinal and aromatic plants in Asia. Through collaboration and partnerships, and based within a regional approach to these issues, MAPPA is involved in formulating and implementing a holistic program which will complement and build on other related research and development activities in South Asia.

The general objective of MAPPA is to enhance the sustainable and equitable use of medicinal and aromatic plant resources in Asia. Initially, MAPPA is focusing its research and development efforts in South Asia region only. This will be achieved by supporting strategic research, building partnerships among the key stakeholders including donors, and enhancing regional and international networking.

Photographs on the cover page (from left to right):
1. Taxus wallichiana Zucc. (Taxaceae)
2. Dactylorhiza hatagirea (D.Don) Soo (Orchidaceae)
3. Butea monosperma (Lam.) Kuntze (Papilionaceae)
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Human ingenuity, traditional knowledge and gains of modern science have enabled us to explore the unexplored, use the underused resources and unravel the mystery or unknowns. However, the same knowledge and tools have also allowed mankind to mine the environmental and natural resources causing wanton destruction, biodiversity loss and ecological imbalances. Unsustainable extraction of medicinal plant wealth and resultant biodiversity loss has been a cause of global concern, which IDRC has embraced as one of the thrust areas of its Sustainable Use of Biodiversity Program Initiative (SUB PI).

The planning and organization of the workshop on Sharing Local and National Experience in Conservation of Medicinal and Aromatic Plants in South Asia have been primarily done as part of our pursuit to receive regular feedback from our partners to inform, influence and improve IDRC’s research on medicinal plants in South Asia. The main objective of the regional workshop was therefore to discuss, share and develop ideas and experience in a participatory and multi-disciplinary manner amongst the policy makers, researchers, resource managers, conservation scientists, field workers, development planners and community organizers in a common forum whose focus was on South Asia. As the workshop had representation from cross-sections of scientists, practitioners, field researchers, government officials and academia, it was a multi-disciplinary gathering. IDRC-based MAPPA program in collaboration with the Ministry of Forest & Soil Conservation (MFSC) and the Institute of Forestry (IOF), Pokhara organized the workshop, which made it a multi-partnership effort as well.

For unavoidable reasons, the preparation of the proceedings has been unduly delayed. We have attempted to include all the plenary and poster presentations in this publication but due to lack of timely submission of the abstracts and/or papers, some poster presentations are not included and only the summary note of some presentations have been included. It is our earnest hope that the combined package of information will be both of practical and academic use to the readers. The market place session was truly an open, participatory and valuable
Sharing Local and National Experience in Conservation of Medical and Aromatic Plants in South Asia

component of the workshop the outcome of which has been briefly summarised.

We would like to thank the contributors of the papers and the posters for their valuable presentations. The lead Editor of the proceedings Dr. Nirmal Bhattarai has done a commendable job of interacting with almost all the authors and obtaining their presentations for which he deserves special thank from IDRC and Ford Foundation - the joint promoters of MAPPA.

You will note that we have included the speeches made during the opening session in the proceedings as we felt that they provide an important source of information regarding respective organizations’ policies and program. The individual speakers’ views also reflect their rich knowledge and experience in the field of medicinal plants, which may be useful and inspirational to the younger generation of researchers and field practitioners.

Finally, I thank everyone in MAPPA/IDRC office and the publishing team for their excellent technical work in bringing out this publication.

Madhav Karki, Ph.D.
Regional Program Coordinator,
MAPPA & Workshop Coordinator
INAUGURAL STATEMENTS
Welcome Statement

Madhav Karki, Ph.D.
Regional Program Coordinator
MAPPA, IDRC, SARO
New Delhi, India

Madam Chairperson of this Inaugural Session and Chair of the Medicinal Plants Specialist Group (MPSG) of the IUCN Species Survival Commission (IUCN/SSC): Dr. Danna Leamann; Respected Chief Guest Mr. Rabi B. Bista, Secretary, Ministry of Forest and Soil Conservation, esteemed colleagues, distinguished participants particularly those who have traveled from foreign countries, ladies and gentlemen.

It is my great honour as well as a privilege to welcome you all in this Regional Workshop on Sharing of Local and National Experience in Conservation of Medicinal and Aromatic Plants (MAPs) in South Asia.

It is my privilege and pleasure to welcome the Chief Guest Mr. Rabi Bahadur Bista, the Secretary in the Ministry of Forest & Soil Conservation for kindly accepting our invitation to inaugurate the workshop. Mr. Bista as you know, even before he assumed the high office of the Secretary in the Ministry has been very supportive of new initiatives in conservation and sustainable management of bio-diverse resources. I fondly remember his support to the establishment of the International Network for Bamboo and Rattan (INBAR) in China – a flagship project of IDRC - on behalf of His Majesty’s Government of Nepal.

I heartily welcome our keynote speakers: Dr. A.L. (Tom) Hammett, Associate Professor of Forest Products & Marketing in the VPI & State Univ., USA, Dr. M.Iqbal Choudhary, Professor of Chemistry in the HEJ Institute of Chemistry in University of Karachi; Dr. Keshav Kanel, Forest Economist & Head of the Foreign Aid Coordination Division in the MFSC; and Prof. VPK Nambiar, Professor and Senior Scientist at the Arya Vaidya Sala, Kerala who will join us shortly. My special welcome to all the MAPPA partners, dedicated researchers and filed foresters who have readily accepted our request to prepare the posters, case studies, display materials and papers to present in the workshop. Their hard work, innovative ideas and anticipated active participation are the main feature of this three-day workshop. It is my pleasure to welcome all the guests who are amongst us to support us in our endeavour.

Research Scientists, Foresters, Development workers, Business people,
traditional healers, and academicians in the South Asian region have long recognized that unsustainable use of their biological resources, especially medicinal plants, has rarely been of direct benefit for them or for the economic development of the rural people. It is therefore necessary to sensitize policy planners, decision-makers, scientists, teachers, NGOs, CBOs, grass-root level workers, youth, general public to the need for greater attention to conserve and develop options to sustainably use our medicinal plants resources and cultural heritage. At the same time it is important to protect the intellectual property rights of the local people who have been custodians of these practices and are dependent on them for their health care and livelihood. Presently, there is an alarming imbalance between growing demand and diminishing supply of medicinal plants that suggest a need for a comprehensive intervention including development of policy and institutional frameworks.

This workshop is to share the local, sub-national, national, regional and international experience among the researchers and field workers from six countries of the South Asian region and five developed countries of Europe and Americas.

I am sure their rich experience and practical knowledge will help stimulate meaningful discussion and suitable actions.

I once again extend my warm welcome to the entire guest and participants.
Message from Ford Foundation

Dr. Doris Capistrano  
Deputy Representative  
Ford Foundation  
New Delhi Office, India

Dear Chairperson, Chief Guest Mr. Rabi B. Bista, Secretary, Ministry of Forest & Soil Conservation, distinguished participants, esteemed colleagues and ladies and gentlemen: Greetings!

I regret that I am unable to be with you today due to other urgent matters that require my presence in Delhi.

However, I would like to convey to you all my sincere and best wishes for the success of this important workshop that brings together government policy makers, researchers, private sector representatives, non-governmental organizations, community-based associations — all key players in the medicinal plants sector in the region.

We, at the Ford Foundation, believe, and have been a witness to the fact that, it is in the meeting of minds of diverse groups and perspectives such as those represented here, where potential breakthroughs are greatest. Workshops and discussions such as this provide fertile ground for developing broader understanding of common issues, for forging creative solutions, and strengthening the foundations for future collaborative action.

This workshop is both timely and necessary. This medicinal plants sector has attracted increasing attention in recent years, not only for its promise to bridge the goals of forest resource conservation and livelihood needs of communities in remote locations, but also for the riches of the local knowledge, tradition and practices which have been such important aspects of medicinal plants use and management and which are key to their future conservation.

MAPPA has a very important role to play at this juncture. Its efforts to bring various groups together to develop improved strategies for sustainable management of medicinal plants will help advance the achievement of common goals. In partnership with IDRC, the Ford Foundation has been privileged to be associated with MAPPA since its establishment in 1996. We join others in expressing our appreciation for the progress that MAPPA has achieved thus far. We look forward to MAPPA’s continued facilitation and leadership in the sustainable management of medicinal plants in the region. And we wish MAPPA and all participants a very productive and successful workshop.

Thank you.
Inaugural Remark

Ms. Elizabeth Fajber
Senior Program Officer
IDRC/SARO, New Delhi, India

Madam Chairperson, the Chief Guest & Secretary Mr. Rabi Bista, distinguished participants, ladies and gentlemen.

On behalf of IDRC, Canada, it is my pleasure to welcome the chief guest and all the participants attending the three day workshop on Sharing Local and National Experience in Conservation of Medicinal and Aromatic Plants in South Asia. In this workshop, IDRC is keenly looking forward to receiving useful feedback from its partners to inform, enrich and improve our program on medicinal plants - both regionally and globally. In my short talk, I would like to introduce to you the salient features of IDRC's program on medicinal plants.

In Asia, a large number of rural poor depend on medicinal and aromatic plants (MAPs) as key sources of primary health care and a critical source of livelihood support. However, their livelihoods are threatened due to the rapid loss of these medicinally and socio-economically useful species and genetic diversity through habitat destruction, non-sustainable levels of harvest, and inadequate policy, fuelled in part by poor economic conditions in the rural communities. Furthermore, knowledge and use of these plant resources are also threatened by a lack of validation and institutional support given to local health practices, cultural change and decreasing availability of the resource itself. The conservation of medicinal plants diversity and their sustainable use for livelihood support have become collective concerns of local communities, national governments and industries alike.

IDRC supports a multi-disciplinary approach towards research on the sustainable use of medicinal plants, with an emphasis on improving conditions of rural poor and marginalized peoples. IDRC is unique in addressing this complex subject in a comprehensive and holistic manner, recognizing the interconnections of issues relating to conservation, livelihood imperatives, economic potential, and use of medicinal plants for local health care. It is essential to understand the linkages between and among the stakeholders within the value chain of this resource in order to identify and develop and ensure opportunities for improved benefits from this resource going to disadvantaged groups, especially...
women and tribal groups. Improved livelihood options and sustainable use to meet local health care needs will similarly support sustainable management of the resources and preservation of unique local knowledge systems.

IDRC supports medicinal plant research activities that are community-based but that can influence national and international policy objectives, principally in the following four areas:

a) Biodiversity conservation; b) Improved access to health care, c) Marketing and employment opportunities, and d) Networking

Finally, on behalf of IDRC, I would like to thank the Ministry of Forest & Soil Conservation, Government of Nepal and the Institute of Forestry for collaborating with MAPPA and IDRC to organize this regional workshop. I wish the workshop a grand succès.

Thank you.
Inaugural Speech

Rabi B. Bista, Secretary
Ministry of Forest and Soil Conservation
His Majesty's Government of Nepal

M'me Chairperson, Distinguished Participants, Ladies and Gentlemen:

I am delighted to be here, equally so for being the Chief Guest of honour for this Regional Workshop on Sharing Local and National Experience in Conservation of Medicinal and Aromatic Plants (MAP) in South Asia (SA). I believe that it is an appropriate and timely decision to have this workshop convened in Nepal, because of our location in the Eastern Himalayan Region, especially so in Pokhara, as it is the picturesque place in Nepal, as well. Let me thank the organizers for being generous to my country and me. Furthermore, on behalf of HMG/Nepal and my own, I would like to extend our warmest welcome to all the foreign participants.

I have been told that at present all allopathic medicines contain 30% natural base, not to talk about the Ayurvedic and Homeopathic medicines which is gaining popularity day by day. Nepal is therefore strategically placed for harnessing this wealth allotted to us by nature and already good amount of the income in the hills is from collection of medicinal and aromatic plants. But if we become little wiser, we will be able to generate enough economic activity through harvesting, farming and utilizing medicinal plants.

My Ministry is trying to work out a project together with IDRC and local people in some remote hill districts of Nepal so as to promote sustainable harvesting, commercial farming, training and utilization of MAP. At least I confess here that we give a high priority in the development of medicinal and aromatic plants. We have the right policy and well articulate programs. But we at the government level firmly believe that the initiative has to come from the individuals and entrepreneurs, possibly in collaborative partnership with foreign investors.

We are ready to promote any of such initiatives. The objectives and themes for deliberations look adequate to me. In addition, your interaction with each other during break and off time will help produce positive results.

Few places on earth match the biological diversity of the Eastern Himalayas, which contain 7500 species (500 within 100 sq.
km.), of higher flora with 2250 species endemic to this region. The plants, mammals, birds, insects, and a multitude of other life forms constitute various ecosystems and maintain vital ecological processes in the eastern Himalayas. Together, their mixture and blend provide continuity of life support systems. The interconnected benefit of conservation has implications for the economic well being, political stability, and the survival of the diverse cultures in the region. The goods and services provided by the natural resources are immeasurable and the livelihoods of millions of people in SA countries are depended on the conservation and sustainable use of these resources including MAP. The traditional use of biologically diverse resources not only reflects a diverse resource-use pattern, but also ways of maintaining livelihood in mountain ecosystems. Maintaining this diversity, both cultural and spatial relationship with the environment is, therefore, consistent with the conservation of the natural world.

Nepal has a wealth of NTFP because of its altitudinal zones and diverse ecosystems. Although we say this proudly and loudly, nevertheless, knowledge, skills, and potential are not fully put together for the larger interest and well being of the local communities. NTFPs constitute one of six forestry sector programs in the master plan where seven are highlighted for promotion: medicinal and aromatic plants, Daphne paper, pine resin, katha, sabai grass, canes and bamboo. Medicinal and religious plants are often gathered on the spot by pastorals while tending their herds at high altitudes during the summer months. Collectors are underpaid and often exploited by middlemen. Biodiversity conservation and poverty alleviation has a direct linkage. The socioeconomic and subsistence needs of the marginal farmers must be addressed in order to conserve biodiversity. There are gender, ethnic, social class and household domain differences which needs to be addressed when discussing equity issues.

Management, uncontrolled & unlimited utilization of MAP, our niche is one area, which you will deal upon and which can make the difference in the mountain areas. Your indulgence for three days, I hope, will be able to deliberate thoroughly on the issues, and come out with possible answers, which hopefully we can use, in the national level planning.

Have a pleasant stay in POKHARA.

I wish the workshop a great success.

Thank you.
Speech from the Chairperson

Dr. Danna J. Leaman, Chairperson
Medicinal Plants Specialist Group
Species Survival Commission, IUCN

I am looking forward to participating in the workshop not only as the representative of the MPSG but also as a keen researcher interested in the conservation and sustainable management of valuable medicinal plants of the Himalaya.

Finally, I thank the organizers for giving me the honour of chairing this opening session. I wish the workshop all the success.

Thank you.
Respected Chairperson, Honorable Chief Guest, Distinguished Participants, Ladies and Gentlemen:

On behalf of the sponsoring organizations and the workshop organizing committee, it is my pleasure to propose a vote of thanks to all of you for your presence in the inaugural session of the Workshop on *Sharing Local and National Experience in Conservation of Medicinal and Aromatic Plants in South Asia*.

First of all, my special thanks are due to the Chief Guest Mr. Rabi B. Bista, Secretary of Ministry of Forest and Soil Conservation (MFSC), His Majesty’s Government of Nepal (HMG/N) for delivering an inspiring, informative and encouraging inaugural speech.

The Medicinal and Aromatic Plants Program in Asia (MAPPA), an initiative of IDRC, Canada and Ford Foundation deserves our unreserved thanks for organizing this timely and useful workshop in our courtyard. The co-sponsoring of the workshop by the MFSC, HMG/Nepal is highly appreciated as it has inspired the organizers to strive to achieve the workshop goals and has contributed to its value. The third organizing partner, my own, Institute of Forestry, especially its faculty members, administrative staff and the students are thanked for their great enthusiasm, support and cooperation in helping us to organize this workshop.

I thank Dr. Danna J. Leaman not only for chairing the session but also for providing her valuable inputs especially indicating the close linkage between the concepts and tools of just concluded Conservation Assessment and Management Planning or CAMP initiative of MAPPA and the regional workshop. We are delighted to hear the valuable message sent by Dr. Doris Capistrano, Deputy Representative, Ford Foundation, and New Delhi for the success of the workshop.

I would like to sincerely thank Dr. Madhav Karki, Regional Program Coordinator, MAPPA, IDRC, and the Workshop Coordinator not only for his informative welcome statements but also his hard work to overseeing different aspects of the workshop. My thanks go to Ms. Elizabeth Fajber, Regional Program Officer, IDRC/ SARO, New Delhi for providing valuable
information on IDRC's Global and Regional Program on Medicinal Plants to the gathering.

Last but not the least, I extend my sincere and warm thanks to all the MAPPA partner organizations and researchers who have come from different parts of the region and world to share rich and valuable research information and knowledge on medicinal plants and other NTFPs which will be useful in planning the development and sustainable management of these resources. I sincerely hope that each of you will get benefited from this forum whose objective is sharing of experiences and exchanging of views on the important subject of medicinal plants.

Finally, I would like to thank the distinguished guests for attending this inaugural session.

Thank you all.
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THEME PAPERS
**Conservation and Sustainable Use of Medicinal and Aromatic Products in North America: Are There Really Lessons to be Learned?**

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**Introduction**

The purpose of this regional workshop is to "discuss, share and develop ideas and experience between and amongst the policy makers, researchers, resource managers, conservation scientists, field workers, development planners and community farmers in a common forum." We aim to share experiences in particular among the countries in South Asia, but we are also interested to share experiences between the North and the South. The organizers have provided an excellent forum that we expect will lead to recommendations for future strategies to governments, international donors and civil society groups to improve the thrust, focus and impact of their support to sustainable use of medicinal and aromatic plant resources by local communities.

Our assignment was to "help set the stage" or present some thinking points for the work at hand at this workshop. We were asked to identify and report on lessons learned in North America in the sustainable use of NTFPs. This was an ambitious goal, as often is found with many areas around the world, we have learned of much MAP experience in our region. However, it is important that we begin with a caveat. Are there indeed lessons to be learned for this region from North America?

We felt at the outset that there is much to be learned right here, and hope that at the end of this session that you will agree. Our observations are based on several years' experience working in projects on the ground, from the authors' professional association of nearly 15 years. More importantly this paper is based on a through sharing experience with colleagues in Nepal and throughout the region. NTFP experiences in several countries of many countries outside North America have also been examined.

What was our approach to the assigned task? First, we discuss the legacy of non-timber forest product (NTFP) and, more specifically, medicinal plant use in North America. We will also discuss briefly MAP

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markets both in North America and throughout the world, and then to describe the constraints to the sustainable use and development of MAP resources. Lastly, we have been asked to relate some lessons that may be appropriate for application in South Asia.

But, before we start, there is one critical question we wish to raise - Are there indeed lessons to be learned for this region from North America? Our answer lies in the realization that there are many similarities between the two regions and we will gain from sharing our experiences! But our overexploitation, lack of information on the sustainable management of MAPs, and the dearth of MAP policies leads us to believe that this region is ahead of the world in many aspects of MAP preservation and culture. What follows are our notes based on the presentation made, and the discussion that followed. We invite your comments and suggestions.

Background

North America has a long legacy of non-timber forest product (NTFP) collection and use. Numerous NTFPs are collected and traded from forests or, as with more recently growing markets and shrinking natural stocks, cultivated for trade. NTFPs have been described in four major groups: eatable products (berries, fruits, herbs, spices, and foods based on plant derivatives); medicinal or dietary supplements (the topic of discussion here), floral products (decorative products); and specialty wood products (carvings, and handicrafts) (described by the authors in Hammett and Chamberlain 1999). As in Asia, medicinal and dietary supplements (or MAPs as discussed here) amount to major component of the value traded in the North American NTFP market.

To get a feel for the scope of MAPs in North America, let's discuss a few common MAPs found in the region. Several are increasingly popular; so much so that their survival in the natural environment is threatened. This lesson is not only to be learned in our region - many plants have been extracted to extinction throughout the world. MAPs such as Foxglove (Digitalis purpurea), Indian tobacco (Lobelia inflata), and Yew (Taxus brevifolia, T. canadensis) have been well known. Many herbal remedies such as Black cohosh (Cimicifuga racemosa), Golden Seal (Hydrastis canadensis), and Slippery Elm (Ulmus fulva) have been popular both within the region and exported outside the region. The region has a history of MAP production and use for several hundred years, and has exported for nearly 400 years.

North America markets herbal medicinal products derived from 175 species. Over 500 species have been found in the Appalachia region alone, with 125 species identified as having medicinal properties. Meanwhile, the North American suppliers are supplying herbal medicinal products to the worldwide market in ever-increasing amounts. As recent as 1998 the
world MAP market saw $16 billion in sales, of that Europe had $7.1 billion in sales and Asia had $5.1 billion in sales. The U.S. alone has $3.9 billion in yearly sales.

Markets for some popular North American MAPs are large and have been expanding. Ginkgo biloba had U. S. sales of $90.2 million in 1997, St. John's Wort had U. S. sales of $47.0 million in 1997, and May Apple saw U. S. sales of $1.5 million in 1992. Such large markets have driven up demand and in some cases, put pressure on natural stocks.

To perhaps identify some lessons learned in North America that may be pertinent in South Asia, let's look at one well-known example found in hardwood forests in eastern North America - the popular Panax quinquefolium or American Ginseng. Patches are still found on north-facing slopes where harvesters collect most often in small quantities. Dried at home and sold to local buyers who consolidate and sell to some large corporations for processing. The export market prefers natural grown, wild harvested Ginseng putting pressure on the wild population. Prices for dried wild Ginseng in isolated cases have reached $600 per pound the price, but more recently has been $114 - $205 per pound. Now listed in CITES, data shows hundreds of tons of Ginseng have been exported from the Eastern U.S. and Canada. Meanwhile, cultivated Ginseng has sold for only $11 - $88 per pound, and due to recent declines in supplies of wild roots, it has been exported in increasingly larger quantities.

Forest harvested Ginseng collected on the forest floor has been the emphasis especially with a perceived price differential estimated by buyers in China (Williams 1989). However, over harvest caused by black market in for “green gold” in North Carolina has lead to concern about sustaining the resource. The Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES) formed in 1975 (Robbins 2000) now lists ginseng in Appendix II. This does not limit its harvest, but regulates and monitors the sale and export trade of wild ginseng.

The price of ginseng is often determined by sentiment, not supply and demand (Kains 1903). Anecdotal stories relate that Chinese buyers sort ginseng root into over sixty different products - all associated with different qualities and prices. The market for ginseng in China remains strong, if not unlimited. As early as 1903, it was estimated that 400 million used ginseng in China, a market estimated at “millions of dollars” (Kains 1903, this large market was confirmed by McCaleb et al. 2000).

**Why this recent MAP markets surge?**

First it is important to define the consumers in North America. In many cases this resurgence in MAP sales is due to “Baby Boomers” who have increased spending power and have become
increasingly concerned about their health. In doing so they have embraced herbal products – not just MAPs. In the past only a small group of health conscious consumers shared this awareness of the benefits of natural medicine. Now an increasingly larger segment of the population knows of the benefits of natural products and can afford to purchase these products. They are more health conscience-knowledgeable of the benefits of using natural products instead of processed medicines or vitamins. The natural product craze is here and growing quickly. The presence of an increasingly knowledgeable segment of the population with adequate disposable income is driving this recent surge in sales.

In addition, buying locally made products is in vogue. Local craft fairs are now found in most areas of the region. Natural or organic products and other fresh items are best sold directly to the consumer. These seasonal fairs facilitate and consequently help to further educate the consumer. In chain super markets, many now have a large section of the floor space devoted to fresh or natural products.

Increased amounts of disposable income have meant more travel and purchase of these products is possible, and desirable. In addition, those who see them as better than recently more invasive techniques or surgical procedures desire alternative medicines. As awareness increases the market for MAPs is growing. One outlet is the international trade fair Natural Products Expo held each year in the fall on the East Coast or in the spring on the West Coast. This Expo hosts over 3,000 producers and more than 45,000 buyers of natural products from not just North America but from around the world.

The industry has matured from a marketing sense. It realizes the importance of consistent product quality, packaging, and consumer’s need for ample product information. In North America, establishing a MAP product certification program is now being discussed – it is a new avenue by which some feel the sustainability of MAP resources may be assured (Robbins 2000). Both authors have participated in initial exploration of the certification of Ginseng. Those who are environmentally concerned to purchase increasing amounts of natural products should be concerned about MAP conservation and would embrace a MAP certification program.

Constraints to sustainable MAP management

There are several constraints to sustainable MAP management that warrant mentioning. First and foremost, the harvest of MAPs is yet to be an issue of public concern. This precludes the attention needed to focus policy. Secondly there is a lack of information and knowledge on the growth and management of many MAPs. In addition, there is no legislative mandate to preserve
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genetic resources. Hence few guidelines exist that would direct policy formulation or assist in adding MAPs to forest management plans.

Most managers of forests (state or private owned) lack the skills and expertise to know and manage MAPs. Knowledge of how fast each species will regenerate is key before managers can prescribe management regimes. Often there are greater demands on managers to manage recreation, timber or watersheds for volume and quality of water.

Lastly, there is no funding mechanism for specific research into the plants, their ecology, uses (as medicines etc.) and their management in the wild or on farms. Several federal agencies including the USDA's Department of Agriculture and Forest Service have fostered some research for a few specific MAPs. But greater support is to assure the identification and sustainable management of key MAPs. Clearly there is need to organize a thorough comprehensive research effort. The eastern region of North America has a long history of MAP harvest and use. However, details are needed about habitat, on the ground inventory, and harvest levels. Without such an ongoing research program that builds on the wealth but accelerates disappearing anecdotal knowledge.

What is needed?

The information and knowledge represented by the experts in this gathering is notable. Herein lie answers to many of the questions asked of you. Beyond that there should be an effort to build awareness on the part of the public in the use and sustainable management of MAPs.

By building this awareness, you need to develop a vocal and visual constituency that supports the use of MAPs and protects for wise use MAP resources. This effort will demonstrate the value of these resources not just to the general well being of the population, and but also the great positive impact on sustainable forest management and biodiversity that increased management of these resources give. This recognition is not wide spread. Several other regions in the world have not assessed or emphasized the impact of these resources. Your region has a long-standing history and much knowledge has already been gathered and cataloged.

Remember the three standards of sustainable development: ecological, economic, and social or cultural aspects of use and management of renewable resources. MAPs are truly renewable and this message needs to come out in packaging, articles such as in the popular press and through any public vehicle you may have access to.

There is great need to develop and extend to MAP field workers appropriate management practices. These should include how to determine current and projected inventory levels, monitoring for sustainable harvest, handling and storage, and, where native populations are
threatened, appropriate culture techniques.

Management and utilization of MAPs

Local producers will gain much from better market knowledge-helping them to make management decisions. With improved marketing knowledge there is sometimes risk of over harvest and loss of resources. However, with proper management techniques and knowledge of the resource and how quickly it replenishes itself, fear of over exploitation should be lessened.

There is also need to learn more about the legal and institutional aspects of MAP trade. Increased understanding of flow of products through marketing channels and market trends would help MAP producers sense market changes and more effectively plans production activities. This greater knowledge of market trends would also help policy makers and enforcement personnel track legal and illegal trade, better understand the impacts of policies and effects of law enforcement efforts. It is important to learn more about how harvest bans or moratoriums impact the market and the resource.

To increase incomes and opportunities for local level enterprises it is vital to increase market transparency. All players along the market chain need to realize the changes that occur and the value added at each level. To do this one needs to identify and profile all the key stakeholders along the chain (such as harvesters, middlemen, and consumers). Once the market is better known it will be easier for producers and processors to set priorities. Improved packaging, labeling, product uniformity, and consistent quality and increased income will result. Based on MAPs’ values and inventory trends, we need to propose areas that need attention of policy makers. Once this information is known, it will be relatively easy to determine new products and value addition strategies. These lessons are true here in Asia, as they are in other regions.

Common issues to increase the priority given to MAPs

There are several issues that have common value between the two regions. How do the MAP products show value at the local, regional and national market potential. Before MAPs can be further appreciated there is a need for a vocal and visual constituency in support of these products and their management. There is great need to organize and promote a vocal constituency that can communicate concern for the resource and access to market authorities.

Since often these wild crafted herbs come from government lands or are poached from private lands, a key question is how to ensure legal and equitable access for harvesting? What is the impact of greater harvest levels on markets? There is a dire need to demonstrate impact of harvest on the resources. How can one suggest
sustainable harvesting without knowing what the resource is capable of producing? In order to manage the resource, we must first better equip ourselves to know the ecology of these plants. What are the sustainable harvest levels and practices? How to enforce harvest regulations?

**Research and Development Needs**

It is important to define, track and estimate markets for MAP products. To facilitate sustainable growth of MAP markets tracking and trend analysis of markets is needed. Producers need up-to-date market information, and sound scientific knowledge about the plants and the resources. It is important to integrate analysis of biology, ecology and socio-economy of MAPs. This integration will add greatly to the utility of the results gained. This information would better serve farmers and foresters. The specific needs for documentation of current knowledge are changing. Demographic and ethnographic studies are needed that help identify the local dependence on MAP resources. The best way to gather this information is through participatory (community-based) research.

What is needed for conservation and sustainable development? Information on the species (number, range, ecology), market information (size, quality needs), species inventory, monitoring, and management, and cultivation and enrichment technologies for MAPs is critical.

There are several questions that need to be addressed before MAPs will attain increased priority. What is their value? What is the local, regional, and national market potential? Who are the clients for MAP research? Are they landowners, the MAP conservation NGO, the extension agent, and forest landowners? Are there others? Each stakeholder group will have a different and evolving set of information needs. It is important that we learn these needs.

Who needs improved MAP cultivation and utilization technologies? What is needed is an organized and vocal constituency that supports the conservation of MAP species and encouragement (incentives for MAP cultivation and increased use). MAPs can be sustainable and locally grown, but this message needs to be communicated those who may slow or stop our efforts to utilize these valuable resources. These are key questions that may affect the sustainable development of MAPs in all regions.

We have been discussing sustainable use and management of our natural resources in many venues. Perhaps key question that needs addressing is what impact does MAP harvest have on forest health? There is great need to discover the true impact of MAP harvest and use on the forest ecosystem and the incomes of local forest users. How might you ensure the equitable use and access of MAP resources and the benefits from their harvest, processing, use and sale?
Let us not be blinded by the value of these products, but look at how to manage the resource so that it will provide incomes well into the future. Let us first know to manage forests for continued or increased access to MAP resources. What are the sustainable harvest levels and practices? Once determined what policies should be developed and put in place, the local officials can implement the enforcement of regulations—especially those that will help ensure the livelihood of MAP producers, and other villagers.

**Conclusions**

Are there lessons from North America for sustainable MAP production? We feel that we should leave this question to you. Hopefully you have seen some of what we feel there to be learned from North America. To raise awareness about MAPs and to help ensure that supplies will be sustained, we all need to learn much about the cultivation, use, and conservation of MAPs in this region.

However, the real lessons need to be learned right here in the region! While all stakeholders in this process play important roles, much can be learned outside the lab or academic community. Listen as your colleagues speak and as farmers and landowners share what they have learned through years of valuable experience. Here you have a wealth of information worth sharing among your selves. Write down how MAPs are used and can be conserved before the memory of these practices is lost. In this context, proper documentation of value addition of indigenous knowledge is important. Nepal and the region have a rich heritage, which needs to be preserved and fostered for its sustained growth. From this rich wealth of knowledge, the rest of the world can gain insight. But to gain from this all we must document, store, and share MAP information. Such sharing here at this gathering will help this region grow stronger in the production of MAP. As the world market is not getting smaller, sharing information on MAPs with those outside the region will help you predict market changes and market expansion.

Finally, thank you for allowing us to participate in this important seminar and workshop. As the Secretary and others said during the inauguration of this event, the sustainable development of MAP resources is critical to the long-term health of the region's forests and to the livelihood of those living in or near the forests.

The lessons learned here will help increase the recognition of the importance of MAPs and their value in the region. We hope to learn much during the workshop, which we will share when we return to North America. Clearly, the real lessons to be learned are right here in this room. Please share and learn in the coming days, and work together across the various regions represented here so that we know that results of hard work will help all those interested in conserving and utilizing this rich heritage.

We welcome your comments and suggestions. We hope that this discussion
will continue. The wealth of the MAP resource and all those who benefit from its wise management and use will gain much from your deliberations here. We appreciate this opportunity and look forward to hearing of great results from this meeting.

Acknowledgement: The lead author is grateful to MAPPA/IDRC for the invitation to attend the Regional Workshop at Pokhara, Nepal.

Literature cited


Improved Harvesting, Processing and Storage of Medicinal Plants: Their Role in Conservation and Quality of Plant-based Drugs

V. P. K. Nambar

ABSTRACT

The importance of medicinal plants used in the Tradition System of Ayurveda has been highlighted. The necessity of resorting to in-situ and ex-situ conservation aspects is brought out. The achievements of the Medicinal Plants (India) Project are described. Harvesting, drying and storage methodologies as on today, importance of the purity of plant raw drugs in the finished product and the research needs for the future is pointed out.

Introduction

According to WHO 80% of the world population is dependent upon plants for health care particularly in the developing economies (Akerele 1992). Our own system of Ayurveda is probably more than 4,000 years old. Charaka Samhita (900 BC) and Susruta Samhita (500 BC) dealing with pharmacopoeias were completed on the basis of the knowledge contained in the Atharvaveda. It is estimated that as many as 3,226 of the 4,752 communities in India (70% of the population) are dependent on traditional plant based medicines (Gadgil and Rao 1998). A status report on ethno-biology in India has revealed that tribal communities use over 7,500 species of plants for medicinal purposes (Pushpangadan 1994). Approximately 25% of the prescriptions dispensed from community pharmacies in the United States contained one or more ingredients derived from plants (Farnsworth and Soejarto 1991). Aspirin, digoxin, codeine, morphine, vindblastine, pilocarpine, cocaine, ephedrine, atropine and emetine used in allopathy are derived from plants (Natesh and Mohan Ram 1999). Following World War herbal drugs slipped from their pre-eminent perch as synthetic drugs took mainstream medicine, since independence, through successive "Five Year Plans" to develop the Indian Traditional Medical Systems (Ayurveda, Siddha and Unani). The 1982 Health Policy initiated efforts to dovetail the functioning of traditional health practitioners and their health services in the total health care system of the country.

There are 460,000 traditional medicine practitioners in India. Of these 223,000 in Ayurveda, 30,456 in Unani, 18,128 in Siddha have registered as practitioners
under the state boards. In addition to private pharmacies, almost all the State Governments have their own pharmacies for production of medicines. There are separate Directorates for traditional systems of medicine in all states. According to a WHO report, there are 215 Hospitals and 14,000 dispensaries in the country devoted to traditional medicine (Bajaj and Williams 1995).

India which is floristically a rich country, is recognized as one of the 12 mega diversity centers of the world ranking 10th among the plant-rich nations of the world and 4th among the Asian countries. Excluding aquatic life forms we have 5,000 species of medicinal plants. A significant proportion of this is utilized in modern medicine, traditional systems of medicine, tribal and folk practice, beauty care and for export.

Only less than 10% of the medicinal plants traded in the country are cultivated. 90% are collected from the wild very often in the destructive and unsustainable manner. However, over-harvesting, loss of habitat, increasing urbanization and shrinking forest-base have resulted in significant decline in the volume of raw materials produced. This has caused irreversible loss of population of medicinal plants. It is therefore imperative to conserve our medicinal plant wealth on a scientific basis.

Ongoing efforts in India include both in-situ and ex-situ approaches to conservation. While in-situ conservation should be the preferred choice, it is unlikely that the pressures on land would permit more than 4% of the geographical area to be set aside as protected area. Hence, it is essential to complement in-situ approaches through ex-situ measures. As a part of this we have encouraged the farmers to enter into the field of large scale cultivation of much needed medicinal species under the Medicinal Plants (India) Project.

Medicinal Plants (India) Project

The project sponsored by IDRC (International Development Research Centre, Canada) was undertaken by Arya Vaidya Sala, Kottakkal (Kerala) with a financial assistance of CAD$ 138945 after getting approval of the Ministry of Home Affairs, Govt. of India for the period 1993 – 1999. Under this project, 20 widely used medicinal plants of Western Ghats region of Kerala have been studied. The studies focused on the distribution, selection of best stocks, developing sustainable techniques on propagation, increasing their availability on a sustainable basis so as to reduce tendency for adulteration, pharmacognostic features, developing modules for on-farm cultivation and drawing up recommendations for their conservation and regeneration in forests. An immediate output is organization of live collection of several provenance of 20 species for reference and research and supplies of their genuine parts for medicine preparation and evaluation. The farmers will be benefited by the
propagation technique developed and the foresters can make use of the information in bio-diversity management and regeneration programmes. Our preliminary investigations on the deterioration on selected plant raw drugs are clearly indicative of the need for research on storage problems.

**Harvesting**

The existing methods of harvesting, processing and storage are thoroughly unscientific leading to total devastation of certain medicinal species from their natural habitats, causing serious deterioration of the harvested raw drug. Harvesting as the vital link between source management and resource use, pre-harvest operation, complexity of non-wood forest products harvesting, multiple harvest and simultaneous harvest of multiple products, post-harvest treatments, and organizational issues in resource management need improvement in tools and techniques.

An important factor that influences the quality of the herb is the time at which it is harvested. The leaves are usually gathered throughout the whole growing period. They are picked either singly or the entire stem is cut off and the leaves are stripped of afterwards. The leaves should be healthy, free from diseases and insect pests, clean and dry. The aerial or top parts of the plant are collected with the flower-bearing stem just before or at the beginning of the flowering stage. Fruits and seeds are collected when they are mature. The harvested herbs have to be transported to the drying shed as quickly as possible.

**Drying**

Proper drying is essential for drugs to be traded internationally. Drying is done to reduce the moisture content up to 5-10 percent to minimize spoilage. A considerable quantity of herbs is dried in the shade. Artificial drying is increasingly being employed since it produces a superior product retaining much of the original flavour and avoiding a hay-like taste. The drying yard should be properly cleaned. The drying temperature has a vital influence on the quality.

In artificial drying, the temperature should not exceed 40°C, as the essential oils and the flavour are lost at high temperatures (Atal and Kapur 1982).

**Storage**

Different types of storage can influence the quality of the herb. Dried herbs store best in the whole form and most buyers choose this form of storage. A further important consideration in storage is to limit contamination. Most authorities recommend storage in air-tight containers in a dry dark place at a temperature not exceeding 18°C. Heat robs herbs of their flavour whilst dampness causes ground herbs to cake and deteriorate. Most authorities recommend that herbs for the retail market should be available in small quantities preferably in jars or packets (Atal and Kapur 1982).
Research Needs

Though considerable research has been carried out on the utilization aspects of non-wood forest plant products, there is little information available on their production, conservation, harvesting and storage practices. Judicious use of the raw drugs in the medicine manufacturing process is also to be considered to avoid wastage of raw materials. The purity of raw drugs and the processing technology have a significant role in determining the quality of the finished product. Taxonomic and pharmacognostic studies are the right tools in determining the correctness of the raw drugs used. Scientific extraction methods will have to be developed and perfected in order to prevent destructive harvesting of non-wood forest produce. Research has to be concentrated on scientific assessment of the utility of other regenerative parts of trees in the place of their roots, so that uprooting the entire trees can be avoided.

Acknowledgements: I record my deep gratitude to the organisers of this function for providing me an opportunity for participation.

References


Highlights and Outcomes of the Conservation Assessment and Management Planning (CAMP) Workshop, Pokhara, Nepal

Nirmal Bhattarai
V. Tandon
D. K. Ved*

Background

Nepal extends along the great Himalayan range from 81° 15' to 88° 10' E longitudes within an area of 147,181 square kilometers. The altitude ranges from 60m to 8848m above sea level. Due to its location along the central portion of the Himalayan range, the country is a meeting zone between the flora of east Himalaya containing many Sino-Japanese species and the west Himalaya, with many west Himalayan floral elements. It has also plants representative of central Asia (Tibet) in its many northern frontiers, especially in the trans-Himalayan regions. Numerous plants representative of the Indo-Gangetic plain are found in its plain and low altitude regions.

About 39.6% of the country’s area is under forest including forestland (29%) and shrub land (10.6%) (DFRS, 1999). Having widest altitudinal range in the world within short distances, Nepal has about 35 major forest types, 75 vegetation types and 118 ecosystems. 6076 taxa of flowering plants belonging to 1534 genera and 216 families have so far been documented including 5% endemic to the country and 30% to the Himalayan range (Press et al., 2000).

The vast deforestation and habitat destruction in the past has not only reduced its vegetal cover but also has threatened its rich plant diversity. It has, therefore, become urgent to systematically document and analyze ecological and taxonomical information about its plant resources before it is too late. The Pokhara CAMP is an attempt, first of its kind, to initiate activities towards recording the threat status of the country’s wild medicinal and aromatic plants flora.

Medicinal and Aromatic Plants (MAPs)

Nepal has an age-old tradition of using plants in the local traditional healing systems that are closely intertwined with the national culture. The country is also a leading supplier of important medicinal and aromatic herbs to the Indian and other

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international markets. The collection, transportation and trade of commercially valuable medicinal and aromatic plants have long been a steady basis of the rural household economy.

Due to increase in population, accompanied by over-exploitation, deforestation and other forms of habitat destruction including increasing development pressures, the country's wild plant resources are shrinking fast, critically threatening the survival of many high value wild medicinal plants. At the same time, although every category of wild flora is under varied threats, available resources restricted the investigation to the assessment of a limited number of medicinal and aromatic plants alone. It is thought essential to take stock of the information available to evaluate the threat status of Nepal's medicinal and aromatic plant species, to identify the information gaps, and to understand the conservation needs of these important resources.

Conservation Assessment and Management Planning (CAMP) Workshop Process

The CAMP workshop process was designed by the Conservation Breeding Specialist Group (CBSG) of the IUCN – the World Conservation Union to direct limited information and resources toward evaluation of extinction risk and to plan adequate conservation measures for the species assessed. The objective of the CAMP workshop is to determine the extent of existing and potential threats to the taxa being assessed and to propose plans for their conservation and management. The CAMP process uses the IUCN Red List categories and criteria to evaluate baseline information gathered on the taxa included in the assessment (IUCN 2001). This process has been applied successfully to assess the threat status of the medicinal flora of several regions in India e.g., South India, North India, Himachal Pradesh and Maharashtra. Information required to assign Red List threat categories includes knowledge of changes in population size, extent of occurrence and area of occupancy, and magnitudes of habitat disturbance, including human interference and use patterns.

Pre-CAMP fieldwork

Gathering and evaluating the quantity and quality of information available are important steps in the CAMP process that must take place in advance of the assessment workshop. A team of 10 experienced field botanists and foresters gathered the species-related biological information, a standard and essential step in the CAMP process. They also gathered socio-economic data by using Rapid Rural Appraisal (RRA) techniques with villagers, collectors, traders, traditional healers, Community Forestry personnel, NGOs, and government institutions from different geographical locations in Nepal. Mr. D. K. Ved, who has facilitated several of the CAMP workshops on medicinal plants in India, also facilitated part of the fieldwork. This innovative step provided
Sharing Local and National Experience in Conservation of Medical and Aromatic Plants in South Asia

more local knowledge of population and habitat changes over time, and information about use and trade, than is normally included in a CAMP assessment process. This reconnaissance resulted in the compilation of information on 125 medicinal and aromatic plant species and their use in need for immediate evaluation.

Pre-CAMP Workshop

A pre-CAMP workshop was held at Dhulikhel, Nepal: 9-10 December 2000, to provide the participants with a thorough knowledge of the CAMP workshop process and application of the current IUCN Red List criteria, and to prepare a short-list of medicinal plants with sufficient data for assessment in the CAMP workshop. Mr. Vinay Tandon having conducted many CAMP workshops in India facilitated the pre-CAMP workshop. Participants included 22 Nepalese botanists and foresters who were involved in field-based research on medicinal and aromatic plants of the country. During the pre-workshop a short list of 77 prioritized medicinal plant species was provided to the participants for further review to select most significant ones to include in the CAMP workshop.

Pokhara CAMP

The main CAMP workshop to assess the conservation and management status of medicinal and aromatic plants of Nepal was held at Pokhara, Nepal, 18 to 20 January 2001. It was organized by the Medicinal and Aromatic Plants Program in Asia (MAPPA) - a joint program of International Development Research Centre (IDRC), Canada and Ford Foundation in collaboration with the Ministry of Forests and Soil Conservation, His Majesty's Government of Nepal. The workshop was held with technical support from the Medicinal Plant Specialist Group (MPSG), Species Survival Commission (SSC), IUCN.

There were 48 participants from 11 countries, including Bangladesh, Bhutan, Canada, Denmark, France, India, Nepal, Pakistan, Sri Lanka, United Kingdom and USA. Four participants represented IDRC's New Delhi based South Asia Regional Office (SARO). The participants included eight members of the Medicinal Plants Specialist Group (MPSG). Almost all the pre-CAMP participants also participated in the Pokhara CAMP. The participants came from a wide range of professional disciplines, including field botany, taxonomy, ethnobotany, anthropology, traditional medicine, forestry, wildlife, plant research, conservation biology, medicinal plant trade, herbal pharmaceutical and biodiversity disciplines. Dr. N. K. Bhattarai, Vinay Tandon and D. K. Ved facilitated the workshop.

The participants, through focused discussions in five working groups each having 7-10 participants and assessing 9-12 taxa of medicinal plants, assessed the threat status of 51 medicinal plant species belonging to 41 genera and 28 families.
Another working group reviewed each working group's assessment. Assignment of the Red List status was finalized for each taxon, in a plenary session, by general consensus of the participants. The Red List categories assigned to the 51 medicinal plant taxa, assessed during the workshop, ranged from Critically Endangered (CR; 3 taxa) to Endangered (EN; 14 taxa), Vulnerable (VU; 23 taxa), Near Threatened (NT; 3 taxa), Least Concern (LC; 1 taxon), and Data Deficient (DD; 7 taxa) (Table 1).

The medicinal plant species assessed represent the range of geographical regions and climatic zone of Nepal. Considering the global distribution patterns, 6 species are endemic to Nepal, 10 endemic to the eastern Himalaya, 3 to the western Himalaya, 16 to the Hindu Kush Himalayan range. The remaining 16 species have broader areas of distribution (Hara and Williams, 1979; Hara et al., 1978, 1982; Shrestha and Joshi, 1996). Considering growth habit, there are 9 trees, 2 shrubs, 4 annual herbs, 4 biennial herbs, 5 climbers; the rest are perennial herb. All the species assessed are used locally for medicinal purposes. Some species having multiple uses include food, spice and condiment, dye, and religious purposes. Majority of the assessed species is used in trade, however some are used in traditional remedies as adulterants or substitutes.

Out of the 51 species assessed (Table 1), 7 are Data Deficient and therefore could not be assigned a Red List category. Among the remaining 44 species of medicinal plant species assigned a Red List category at Pokhara 22 species have been earlier assessed at different CAMP workshops for different regions in India. For example, Lucknow CAMP (1997) included 16 species (Aconitum heterophyllum, Arnebia benthamii, Butea monosperma, Curculigo orchioides, Dactylorhiza hatagirea, Dioscorea deltoidea, Gloriosa superba, Jurinea dolomiaeae, Nardostachys grandiflora, Panax pseudo-ginseng, Podophyllum hexandrum, Rauvolfia serpentina, Rheum nobile, Swertia angustifolia, Swertia chirayita and Taxus wallichiana) that has been assigned a threat category by the Pokhara CAMP (2001). Likewise, Pune CAMP (1998) that assessed the threatened medicinal plants of the Maharashtra State included 2 species (Oroxylum indicum and Rauvolfia serpentina) assessed at Pokhara. Kullu CAMP (1998) assessed medicinal plants of the Indian states of Jammu & Kashmir and Himachal Pradesh in the western Himalaya that included 8 species (Aconitum heterophyllum, Arnebia benthamii, Dactylorhiza hatagirea, Jurinea dolomiaeae, Nardostachys grandiflora, Podophyllum hexandrum, Rheum australe and Rheum moorcroftianum) assessed at the Pokhara CAMP. Likewise, Southern India CAMP that assessed medicinal plants of the Indian States of Kerala, Karnataka and Tamilnadu included 6 species (Gloriosa superba, Michelia champaca, Operculina turpethum, Oroxylum indicum, Piper longum and Rauvolfia serpentina) assessed at the Pokhara CAMP.
The Pokhara CAMP assessed 8 species of plants that are included in Appendix II of CITES: Dactylorhiza hatagirea, Ephemera macraei, Nardostachys grandiflora, Otochilus porrectus, Podophyllum hexandrum, Rauvolfia serpentina, Dioscorea deltoidea, and Taxus wallichiana (Shrestha and Joshi, 1996; Dutta and Jain, 2000). Among the assessed taxa, collection of two species namely Dactylorhiza hatagirea and Neopicrorhiza scrophulariifolia has been banned by the Government of Nepal under Forest Act 1993. Likewise, two tree species viz. Michelia champaca and Pterocarpus marsupium have been brought under protection while four species viz. Rauvolfia serpentina, Nardostachys grandiflora, Valeriana jatamansii, and Taxus wallichiana are restricted for export in their crude forms. Some of the assessed species are included in the Red Data Sheets in India, e.g., Aconitum ferox, Dioscorea deltoidea, Nardostachys grandiflora and Panax pseudo-ginseng (BSI, 1987-98).

Experience Gained and Lessons Learned

- For the first time in the world, the latest version of the IUCN Red List categories (version 3.1) has been applied in a CAMP workshop.
- Developing human resources in South Asian countries and improving organizational capabilities for future CAMP efforts are the most noted achievements.

- Assessment of 6 species endemic to Nepal represents their global Red List assessment.
- Assessment of additional 29 species endemic to different sectors of the Himalayan range has provided information from a sizeable part of their limited distribution range. Opportunities exist to advance cumulative efforts in their conservation and management in the region.
- The percentage proportion of the assessed species in Nepal in relation to its total known distribution, as assessed by the participants, are useful to understand their regional-level threats.
- Species in trade dominate the assessed ones providing evidence that commercial extraction from the wild is one of the major threats.
- The workshop findings can have far reaching implications are important provided the lessons learned are used to review and reform conservation policies in Nepal in particular and South Asia in general.
- IDRC/MAPPA is currently assisting a number of projects focused on MAP conservation and management initiatives in the region. The present experience should facilitate its future course as well.
- The lesson learned, and recommendations derived, can be of use to the government, researchers and donor agencies.
References


Dutta, R. and Jain, P. 2000. CITES Listed Medicinal Plants of India. TRAFFIC-India/WWF-India, New Delhi, India.


The final report of the Pokhara CAMP workshop has been published and available for dissemination.

Contact:

Dr. Madhav Karki, MAPPA Program Coordinator, IDRC/SARO 208 Jor Bagh, New Delhi - 110003, India. E-mail: mkarki@idrc.org.in
Table 1: Details on plant species assessed at Pokhara CAMP (2001).

<table>
<thead>
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<th>Plant species/family</th>
<th>Threat status</th>
<th>Habit</th>
<th>Distribution</th>
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<td>Michelia champaca (Magnoliaceae)</td>
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<td>Pterocarpus marsupium (Papilionaceae)</td>
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<td>Rauvolfia serpentina (Apocynaceae)</td>
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<td>Aconitum balangrense (Ranunculaceae)</td>
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<td><em>Aconitum ferox</em> (Ranunculaceae)</td>
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<td><em>Lilium nepalense</em> (Liliaceae)</td>
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<td><em>Maharanga bicolor</em> (Boraginaceae)</td>
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<td><em>Maharanga emodi</em> (Boraginaceae)</td>
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<td><em>Pongamia pinnata</em> (Papilionaceae)</td>
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<td><em>Swertia multicaulis</em> (Gentianaceae)</td>
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Abbreviations:

**Threat categories:** EN (Endangered); VU (Vulnerable); NT (Near threatened); LC (Least concern); DD (Data deficient).

**Habit:** T (Tree); S (Shrub); C (Climber); TH (Trailing herb); EH (Epiphytic herb); H (Herb).

**Distribution:** EH (Eastern Himalaya); WH (Western Himalaya); HKH (Hindu Kush Himalaya).
Policy and Institutional Bottlenecks: Possibilities for NTFP Development in Nepal

Keshav Raj Kanel*

Introduction

Nepal is endowed with about 7,000 species of higher plants, out of which more than 700 species are reported to be of medicinal importance. Nepal’s altitudinal variation from 60 meters to more than 8,000 meters within a small area of 14.7 million hectares provides varied habitats for the natural growth of various plants.

Nepal’s forests provide a spectrum of products and services. Non-Timber Forest Products (NTFP) include those products, which have conventionally been termed as Minor Forest Products (MFP) such as bamboo, canes medicinal and aromatic plants (MAPs) and their products. Importance of NTFPs has been increasingly recognized because of their commercial, socio-economic and ecological values together with use values, providing livelihood support to many poor rural families of Nepal.

The importance of NTFP in terms of high value but low volume and weight increases as the altitude increases. Therefore, high mountains and hills are rich in valuable NTFPs, mainly MAPs of high commercial value. On the other hand, the potential of managing forests for timber production is extremely high in the Terai and Inner Terai. The high value NTFPs are eventually exported mainly to India through Terai districts. Despite this, very little research has so far been carried out on the biological, commercial, socio-economic and institutional aspects of NTFPs in Nepal. This is mainly because NTFPs are considered to be a common property resource, collected from the wild by villagers and traded through multiple actors and market channels within a confusing policy environment.

District Forest Offices (DFOs) are responsible for recording the quantity of NTFPs collected from the national forests of Nepal. However, their record keeping system is very unreliable and outdated. Community Forest User Groups (CFUGs) are now allowed to charge fees (royalty)

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for the collection of forest products including NTFPs from their community forests. For this to happen, they have to mention it in their Operational Plans duly signed by the concerned District Forest Officer. Otherwise, the District Forest Offices collect royalties of the forest products like the one collected from the national forests. In fact, collection of royalties by CFUGs has not happened in many CFUGs in the country. Sometimes, they also charge export (Nikashi) tax, which is different from the custom duty of 0.5 percent imposed by the custom offices while exporting the NTFPs. Permit systems have been designed to regulate the collection, trade, processing and marketing of NTFP. Although they have been devised to attain lofty goals of sustainably managing the forests, promoting value addition within the country and generating revenue, their enforcement is ineffective. Instead, they have increased the transaction cost and encouraged rent-seeking behavior.

The official revenue from the sale of NTFPs from the national forest of Nepal is about 10 percent of total royalty of about NRs. 320 million (US$ 4.7) collected by the Department of Forests (DoF) during 1997/98. However, their actual contribution to local and national economy is substantially higher. One report suggests that Nepal annually exports over US$ 26.7 million worth, mainly raw, NTFPs to India (ANSAB 1997). My preliminary estimate reveals that NTFPs valued at US$ 18 million at border price are annually exported to India (Kanel 1999). The Environment and Forest Enterprise Activity (EFEA) project estimates that the market value of officially collected NTFPs from the eight project districts is about US $ 4 million, out of which less than one percent is from the two Terai districts, Banke and Bardia (EFEA 1999). These estimates reinforce the high potential of promoting the development of NTFP sub-sector in the hill and mountain districts of Nepal.

**Objectives of the Review Paper**

Although the scope of NTFP development and potential contribution to local and national economy is substantial, substantial hurdles remain in the design and implementation of policy that affect collection, trade, use and processing. The general objective of this paper is to explore the policy and institutional issues related to the management and promotion of NTFPs in Nepal. My argument is that policy and institutional reforms are feasible, and they can create both higher employment, and income opportunities to the multiple stakeholders which are engaged in NTFP collection, conservation, utilization, trade and value addition. This paper has been prepared in the context of EFEA area. However, the policy regime and constraints related to NTFP and MAP is highly representative for the whole country.

**NTFP Policy Issues in Nepal**

The policy and regulatory constraints related to the development and promotion of NTFP in Nepal are mainly of four types:
A. Regulatory policies
B. Fiscal policies
C. Institutional issues
D. Marketing and trade issues

A. Regulatory Policy

The regulatory policies are related to harvesting/collection, transport and processing of NTFPs in Nepal. Unsustainable harvesting of NTFPs from wild is a serious issue which is also related to the principles and mechanism of appraising, monitoring, enforcing and sanctioning rule-breakers in the sustainable management and harvesting of NTFPs. Various types of permits have been designed to implement regulatory policies in Nepal although no systematic and detailed inventory of NTFPs has so far been undertaken. The transaction cost of these instruments such as issuing permits, monitoring sustainable harvesting, enforcement of rule-breakers etc. is a serious financial and economic issue. Moreover, the provision of these permits has encouraged rent-seeking behavior among various stakeholders.

There are various regulatory provisions, which have impeded the development of this sub-sector. They are:

- Collection permits have to be obtained from the DFO for the collection of NTFPs from government forest or in pastureland and from CFUGs for their collection from community forests;
- Transit/export permits of unprocessed NTFPs have to be obtained from the DFO;
- The Department of Plant Resources (DPR) issues export permit for the processed product. The office is located in Kathmandu and exporters have to travel to Kathmandu from regions to obtain such permits;
- A permit is also required from the Department of Cottage Industry to establish even a micro-enterprise;
- Limited time (usually 15 days) is given by DFO to transport and export NTFPs, although such a time limit is neither specified in any regulations nor actually practiced fully;
- There is a legal ban on the collection of two high value species;
- There is a ban on the export of eight NTFPs in their raw forms; and
- Multiple checkpoints have been established for verification while transporting NTFPs and other forest products leading to high transaction cost and side payments.

B. Fiscal Policy

Fiscal policies are related to the imposition of various types of taxes and subsidies that affect various agents involved in the collection, processing and export of NTFPs. Revenue collection mechanisms such as royalty fixation, export and other informal taxes are included in this category. Some of the community forestry projects are now providing materials such as seeds, seedlings and some block grants to promote the cultivation of NTFPs. The
USAID funded EFEA project is implementing programs that provide material and technical assistance to members of CFUGs to promote and expand NTFP related activities in community forests.

Major fiscal policy constraints in the development of NTFP sub-sector are as follows:

- The system of royalty fixation and collection is irrational;
- Different forms of informal taxes are levied by various organizations such as police, school, Village Development Committee (VDC), District Development Committee (DDC), municipality, etc.;
- There is an additional export tax of 0.5 percent of the value of product;
- The Federation of Nepal Chamber of Commerce and Industry (FNCCI) issues certificate of origin to requesting traders in the eastern part of Nepal. It charges a tax of 0.06% of the value for issuing such certificate;
- The mechanism for charging export tax on the value of the product is not clear. It is said to be based on market price but market price means a price relative to a particular market and may differ from market to market.

C. Institutional Issues

Two main stakeholders, CFUGs and DFOs are involved in the development and promotion of NTFPs in community and private forests. Various other stakeholders are also involved in the trade, processing and marketing of NTFPs. The relationship, right, revenue collection system among the stakeholders and their roles are fundamental for the sustainable management, value addition and employment generation. Coordination and cooperation among these stakeholders is a major policy issue having impacts on the development of NTFP sector.

Main institutional constraints in the development of NTFP sub-sector are as follows:

- Normally, CFUGs' operational plans are prepared for five years and are approved by DFO. It needs to be renewed after five years. However, the right to revise an operational plan lies with the CFUGs but DFO needs to be informed;
- Most of CFUGs' operational plans are too restrictive. They require special permission for harvesting NTFPs and harvesting green but matured trees;
- The mechanism of handing over of the Terai and hill/mountain forests to CFUGs is not well organized;
- Shortage of DFO staff in mountain and hill districts is adversely affecting the handing over process and subsequent forest management support;
- There is a provision of CFUG fund. All the income from a community forest has to be deposited in that collective fund.
Part of this collective fund can be used only for collective action. This creates a restrictive incentive for CFUG members to intensify the management of community forest;

- Coordination among different stockholders is difficult task. There seems to be the need of establishing a NTFP board for policy coordination and research. It should have members including different stockholders but majority of the board members should be represented from the private sector;

- There is very little consistency and transparency in the implementation of forest rules in NTFP collection and transit. For example, Salyan district DFO issues collection permits only to those who are registered in income tax office. In the Terai, some of the DFOs collect royalties before issuing collection permits. In fact, royalties are supposed to be collected after NTFP collection depending upon the quantity of product collected. Therefore, the procedures of issuing permits and levying taxes are not always transparent.

D. Marketing and Trade Issues

Many agents and institutions are involved in the collection, trade, processing and marketing of NTFPs. Marketing information on, and knowledge of, NTFP is very weak among the collectors, traders and government officials. Similarly, capital market is imperfect in the rural areas. This has led to high interest rates to be paid by the NTFP collectors in the remote areas of Nepal. Input and output markets need to be made more effective and efficient for the growth of NTFPs.

Major issues in marketing and trade of NTFPs are as follows:

- People involved in the regulation of NTFP collection and export e.g. DFO staff, Custom staff, Police etc., have difficulties in identifying NTFP species especially Medicinal and Aromatic Plants (MAP);

- Many of the MAP species have more than one local names mentioned in the Forest Rules 1995. Thus, in many cases the same product or same species has different royalty rates;

- The rural poor especially the marginalized community groups mostly collect NTFPs. They always face shortage of capital. There is no established formal credit system in those remote areas. Capital market imperfection inhibits them to get reasonable gain from trade. In many cases, the wholesale traders issue money in advance and charge high interest rates on the money loaned. In other cases, the traders purchase NTFPs on discount because they have provided loan in advance for collection. Therefore, establishing efficient rural micro-credit system could address this problem;

- Many of the NTFP collectors are poor and live in isolated areas. In these places, illiteracy and poverty are wide spread. Supporting them with marketing information such as price, demand and
market could increase their earning as well as bargaining power. Similarly, training on record keeping and other capacity building could be equally beneficial;

- In this context, the role of the government in the establishment and operation of NTFP enterprise should be reviewed. For example, Herb Production and Processing Company Limited (HPPCL) is a government owned company. The General Manager and the board members are government employees while the chairperson of the board is politically appointed. The company is operating on loss, possibly the main cause is its being over-staffed. The government has targeted to privatize HPPCL during the current ninth five-year plan.

- CFUGs can establish and run enterprises. However, they appear and behave like non-profit NGOs. The role of CFUG in the establishment and operation of processing units should be analyzed.

**Recommendations**

On the basis of this study following recommendations have been proposed:

**Remove the ban on the export of NTFPs**

The objective of the government should be to capture values of these products through their collection, processing and trade in the form of tax or royalty. This way, all the concerning parties, the government, collectors and traders could benefit from these renewable natural resources. There is no justification of banning the export of some products in row and the existing ban needs to be removed. Fortunately, the government removed the ban on the collection and trade of Yarsa Gumba (*Cordyceps sinensis*) in the fiscal year 2001/2002, although it cannot still be exported in the raw form, which is what the market accepts.

**Develop a mechanism to regularly review the royalty rates**

The market price of NTFPs fluctuates over time. In order to overcome this problem, a mechanism should be developed and practiced so that representative of the government and other parties involved in NTFP management and trade participate in making a decision on the royalty rates.

**Review royalty rates and remove multiple royalty rates for the same species**

Present royalty rates should be reviewed in relation to changing markets. NTFPs with different local names but obtained from the same species should have the same royalty rate. The local name should be matched with scientific name. The royalty review committee should also have representations from collectors, traders, Custom Department and botanists. In fact, a task force comprising of personnel from the Department of Plant Resources, Department of Forests, and traders' representatives could
immediately be formed to identify the scientific names of NTFPs traditionally exported from Nepal. The task force should visit the border towns of Nepal from where these products are exported and identify these products. This information, then, should be used in the review of royalty rates and in removing the multiple royalty rates for the same species.

**Strengthen capabilities of CFUGs and other stakeholders**

The training centers of the Forest Ministry should give technical training to CFUG members and private individuals in NTFP management, harvesting and storage so that the productivity is increased and sustainability maintained. An association of herb traders like Jadibuti Association of Nepal (JABAN) should obtain market information of important MAPs and disseminate this to CFUGs to pass it over to small-scale traders and collectors.

**Develop a mechanism for issuing free permit for NTFPs grown on private land**

There exists a mechanism for collecting royalties of NTFPs by CFUGs grown on community forests. But, the government gets royalty from the NTFPs grown on other national forests. There is no mechanism of issuing a certificate of origin of NTFPs produced by farmers on their private land. Therefore, such a mechanism should be developed and made operational so that private entrepreneur will also get their value by cultivating NTFPs on their private land. One option could be to assess the amount of NTFPs grown on private land by a team comprising of DFO, District Development Committee (DDC), VDC and CFUG representatives. The team would then issue a certificate of origin to the private owner to get a free transit for export.

**Revise operational plans so that CFUGs could collect revenue from NTFPs grown on CF**

CFUGs are allowed to capture revenue from the NTFPs grown on their community forests only if it is mentioned in their operational plans which, otherwise, is collected by the District Forest Office. Therefore, operational plans of CFUGs should be reviewed and, if needed, revised so that they get their proper share.

**Develop a mechanism so that contributing households obtain compatible personal benefits from their community forest**

To link development of community forestry program with poverty alleviation, a mechanism should be developed to transfer some benefits of community forests to those who participate in their development and management. For example, households who use their labor for managing medicinal plants in community forests could be paid with some percentage of income generated from that product. This way, a compatible incentive system could be designed so that poverty alleviation and forest
management could be fruitfully linked. This is a major policy reform that needs to be further probed based on the experience of Joint Forest Management Scheme in India.

**Train officials involved with trade in the identification of NTFPs**

To charge any fee the product should be properly identified. Inability to identify most NTFP species is a bottleneck in fixing royalty rates and its collection. Often, NTFPs are valued less than they are worth. Therefore, officials involved in royalty and tax collection should be trained in identifying NTFP species, cultivated or collected.

**Develop credit facilities in remote areas so that trader do not exploit collectors**

Presently local collectors of NTFP have to depend on traders for finance. Local financiers charge these collectors high interest rates. Therefore, credit facilities should be developed and linked to the development of NTFP in remote areas of Nepal.

**Conclusions**

Non-timber forest products, especially medicinal and aromatic plants are the important renewable resource that is closely related with the livelihood of majority of the rural population. Training, capacity building, and empowerment of the stakeholders, accompanied by the provision of related information, are highly desirable to provide appropriate benefits to the various stakeholders involved in this sector.

Critical review of the existing NTFP policy, accompanied by justified revisions considering the above mentioned recommendations are the most urgent tasks for the sustainable management of the resource as well as economic development of the stakeholders.

**Acknowledgement:** The author is grateful to MAPPA, IDRC for the invitation to attend the Regional Workshop at Pokhara, Nepal.

**References**


Recent Trends in Medicinal Plants Research

M. Iqbal Choudhary
Atta-ur-Rahman*

Plants and Human Health: Current Perspective

1. Plant Products are used as
   a. Foodstuffs
   b. Flavoring agents and spices
   c. Perfumes and cosmetics
   d. Pharmaceutical and biological agents

2. Over 120 compounds from 90 plant species are available as prescription drugs

3. Over 88% of world's population (5.3 billion people) relies on plant-based medicines for primary health care

4. Approximately $5 billion were spent in USA on phytoceuticals (1998)

Drugs from Plants: Future Perspective

1. More acceptance for the phytotherapy

2. Use of biotechnology and genetic engineering for the production of plant-based medicines (Cell culture, targeted biosynthesis, etc.)

3. Demand of plant-based medicines for age-related diseases (autoimmune and degenerative diseases)

4. Preventive medicines (antioxidant, vaccines, nutritional therapy, etc.) will be more important

5. Many new diseases among the poorest due to microbial resistance and water shortage

World in 21st Century

1. 100% increase in World's population (12 billion by the year 2050)

2. 60% reduction in forests cover – Loss of Biological Diversity

3. Life expectancy close to 100 years in most parts of the world – More aged people

4. World resources of fossil fuel will be totally consumed – More emphasis on renewable resources

New Approaches in Plant-Based Medicines

1. Rapid de-replication by machine-based methods (hyphenated techniques LC-MS, LC-NMR, GC-MS, etc.)

2. Knowledge-based selection of plants (Ethnobotanic, chemotaxonomic, zoopharmacognosy)

3. Use of automated assays and high-throughput screening for bioactivity-directed isolation

* Prof. Dr. Atta-ur-Rahman, H.E.J. Research Institute of Chemistry, University of Karachi, Karachi - 75270, Pakistan.
4. Combinatorial chemistry on plant extracts – Increasing phytochemical diversity

5. Better control on the production of secondary metabolites by understanding and use of the ecological and stress factors

6. Structure modification of natural products via biological derivatization methods

**Rapid De-replication**

1. De-replication against the growing number of known natural products

2. Use of hyphenated techniques such as LC-MS, LC-NMR/bioassay systems, etc. to discern the probability of active or new principles in active extract

3. On-line search of databases both for chemical structures and reported biological activities

**Knowledge-based Selection of Plants for Drug Discovery**

1. Ethnobotanical approach – Let folk wisdom point the way to new medicines
   - Indigenous knowledge – Greater chances of success

2. Targeted selection / scientific selection of plants
   - Chemotherapy – Selection of close relatives of plants known to produce useful compounds
   - Ecology-based selection of plants that live in particular habitats

3. Zoopharmacognosy – Use of Animal instinct for the unbiased selection of plants

*Figure 1. De-replication of Natural Products*
Figure 2. Ethnomedically Driven and Mass Screening
Drug Discovery Processes

**ETNOMEDICALLY DRIVEN**
Drug Discovery Process

- **Humans**
  - Clinical Studies
  - Oral Screening
  - In-vitro Studies
  - Random High Volume Screening
  - New Chemical Lead
  - Combinatorial Chemistry

- **Humans**
  - Clinical Studies

**MASS SCREENING**
Drug Discovery Process

- Rapid screening of thousands of compounds - Accelerated pace of research
- Less amount of plant extract required
- Specially suitable for the isolation of bioactive constituents from complex plant extracts

**Ethnobotany**

1. Ethnobotany is the study of the relationships between plants and people
2. 89 Plant-derived drugs, currently used in modern medicine, were originally discovered through the study of traditional cures and folk knowledge of indigenous people
3. Ethno-directed selection of plants, the screening of randomly collected plants

**High-throughput Biological Screening**

1. Use of *in-vitro* biological assays (biochemical, cellular and microbiological assays) as automated high-throughput screens

**Combinatorial Chemistry on Plant Extracts**

1. Bioassay-directed isolation and on-line structural studies on most active phytochemical derivatives
2. Knowledge of chemical structures and their varying biological activity – Better understanding of the structure-activity relationship (SAR)

3. More diverse than all synthetic combinatorial chemistry libraries

4. Multiplying the structural diversity of phytochemical mixtures by planned combinatorial chemistry

5. Rapid production of libraries of hundreds, or thousands of diverse natural products

6. Automated assay and high-throughput screenings on combinatorial natural product libraries

Chemistry on the Production of Secondary Metabolites

1. Secondary metabolites are the response of plants against the ecological and stress factors

2. Better understanding of chemical ecology and its relationship with the production of specific plant metabolites

Figure 3. Combinatorial Chemistry on plant extracts
Sharing Local and National Experience in Conservation of Medical and Aromatic Plants in South Asia

3. Use of ecological knowledge for the production of secondary metabolites

**Biological Derivation of Phytochemicals**

1. Use of microorganisms, and intact plant and animal cells for the transformation of phytochemicals

2. Greater understanding of enzyme system responsible for structural transformation

3. Specifically designed biological agents for chemical derivatization

**Acknowledgement:** The former author is grateful to Medicinal and Aromatic Plants Program in Asia (MAPPA), International Development Research Centre (IDRC) for the invitation to attend the Regional Workshop at Pokhara, Nepal.
POSTER PRESENTATIONS

LEARNING FROM CONSERVATION EXPERIENCES
Conservation Assessment and Management Planning (CAMP) for Prioritization of Medicinal and Aromatic Plants in Nepal

Comments on Behalf of the IUCN/SSC Medicinal Plant Specialist Group (MPSG)

Danna J. Leaman

On behalf of the IUCN, and the MPSG, I would like to thank the participants, and the organizers of this workshop for this opportunity to observe, and in a very limited way, participate in, the process of the CAMP and Red List threat assessment. It is indeed a major understanding, requiring the time, energy, and commitment of many individuals. I can assure you that I will not so innocently propose to any colleagues that they include the Red List assessment amongst their research priorities and strategies.

You may have wondered over the last few days of hard work, how does this process and the resulting Red List assessment contribute to the actual, practical conservation efforts you are making in your own capacities. You are not alone. I have asked myself this question, too. I’ve been thinking about what incentive there is to encourage people like yourselves to contribute your expertise to this effort, and what incentive there is for organizations like the International Development Research Centre (IDRC), and the Medicinal and Aromatic Plants Program in Asia (MAPPA) to support these efforts.

I propose the following five incentives:

First, I believe we can all claim to have benefited from sharing knowledge and information and making useful connections with each other that we will take away and apply to our own work.

Second, there is the increased understanding and appreciation of how much we need to know in order to assess the conservation status of a plant species, how much of this information we lack, and how important are the field assessments, trade assessments, and field monitoring that make up much of the really hard, long-term labour of conservation. I think we have also better understood how fundamental this research and this knowledge is to all the grander schemes we have to enable people to benefit from the contribution of medicinal plants to economics, cultures, and health.

Third, it is very clear from this gathering what a precious resource you are - you who have the technical knowledge and skills to contribute to this process, and also how rare a resource you are. We need a rescue and regeneration program for this
expertise, and the passion and commitment needed to apply it to conservation.

Fourth, this CAMP in particular, with the broad representation of people involved in trade, enterprise development, cultivation, and traditional health, has highlighted the value of combining these various kinds of knowledge to identify priorities and strategies for conservation action well before a species has reached the stage of threat, and ultimately extinction in the wild.

And fifth - your particular contribution to the Red List program - to the global Red List, and to the accumulation of local, national and regional information gathering that adds up ultimately to a better understanding of the conservation status of species than we can ever achieve without this kind of pooling of information, however imperfect the process may seem. We have begun to create a picture of the conservation status of 51 important species of medicinal plants that occur in Nepal, but some of which are important throughout the Himalayan region. On the basis of the Red List assessment, once it has gone through the rest of the process of review and evaluation, the priority you have assigned to each of these species can be compared with all other species, and the conservation actions required can benefit from a global effort to preserve species threatened with extinction.

This is the power of the Red List that the collective impact of what we know together, and more importantly, a call to act together to protect species that are important to us in many different ways in our own spaces. There are few groups of species - plant or animal - that inspire the interest and the passion of so wide a constituency of researchers, users, and beneficiaries. We must work together to apply conservation tools, like the Red List, and the CAMP, work more effectively for this group of species. This workshop has indeed taken on this challenge. I will make the commitment, on behalf of the MPSG, to work with the regional membership of the MPSG, as it evolve, to build on the results of this meeting, both at the level of the global Red List and how it is developed and used, and within region, in supporting conservation action for medicinal plants.
Health Care Development and Medicinal Plants Conservation at Shey Phoksundo National Park, Nepal

Y. Aumeeruddy-Thomas
Y. C. Lama
S. K. Ghimire

ABSTRACT

This paper describes the concepts, approaches and results of developing a model for strengthening community-based management of medicinal plants, particularly for local health care, in Shey Phoksundo National Park and its buffer zone in Dolpa district. This project is part of a wider initiative to build capacity in applied ethnobotany in developing countries. While the trade of medicinal plants from the district puts high pressure upon certain species such as Nardostachys grandiflora and Picrorhiza scrophulariiflora, a large number of species are selectively harvested by amchis¹ for local health care. Based on the results of participatory planning and interdisciplinary research, the project has focused on two interrelated objectives of developing a community-based management system for medicinal plants and improving local health care. The promotion of amchis knowledge together with the sustainable use of medicinal plants for health care has constituted a major approach of the project to reinforce community-based management of medicinal plants inside the park. In the park buffer zones, ongoing work now aims at a better understanding of the trade system and of the impact of collection for trade on resources.

1. INTRODUCTION

The Himalayan region has a large variety of medicinal plants which are used in formal traditional medical systems, such as the Ayurvedic and Siddha, the Chinese, the Unani and the Tibetan, as well as by a large variety of local folk medical systems. Medicinal plants have been used in the Himalayas not only locally but have been exchanged or form part of secular trade systems (Edwards 1996; Dobremez 1976). Trade, however, is increasing at a tremendous rate, because of the expanding market for phytomedical products in the region, as well as internationally. About 11,694 tons of air-dried herbs were collected for trade in Nepal in 1993/1994 as compared to 3448 in 1989/1990 (Bhattarai 1997). In certain areas of Nepal almost 50 percent of village populations are engaged in collection and

¹ Practitioners of the Tibetan system of medicine
sale of medicinal and aromatic plants (MAPs) (Olsen and Helles 1997). In Gorkha District, Nepal, 25-100% of households in a given village participates in commercial collection of MAPs; 15-35% of the income of poor households in the northern and central parts of this district comes from the sale of MAPs (Olsen 1998). Over 90 percent of the total export is to India and mostly in crude form (Bhattarai 1997). From India products are re-exported to other countries either in crude forms or after primary processing, in addition to being used in the Indian Ayurvedic pharmaceutical and aromatic industries (Edwards 1996; Bhattarai 1997; Olsen 1997). Airplanes, if not by motorable roads, a factor that has also enhanced the overall trade of medicinal plants from the Himalayas (Aumeeruddy 2001), now link remotest areas of the Himalayas.

The People and Plants Initiative (PPI) project in Shey Phoksundo National Park (SPNP) and its buffer zone is part of a global initiative by WWF and UNESCO (1992-2000) to build capacity in developing countries to address conservation and development issues related to use and management of plant resources.

WWF-Nepal program is implementing this project in Nepal with technical support from PPI. The field project started in 1997 in conjunction with WWF-Nepal Program’s Northern Mountain Conservation Project (1997-2001) at SPNP, which aims “to promote community natural resources management, and protected area planning and management.” Funding for the PPI project is from the European Union and the Department of International Development. Initially planned as a four-year project (1997-2000), it has now been extended for four more years (2001-2004). Key achievements of this project during its first phase (1997-2000) have been the setting up of a community-based management system in one Village Development Committee (VDC), Phoksundo, located inside SPNP. This management system is based on amchis’ knowledge of the management of medicinal plants, existing local institutions for the control and management of MAPs, and the setting up of Medicinal Plants Management Committees (MPMCs) linked to a Traditional Health Care Centre (THCC).

2. GOAL OF THE PROJECT

The major goal of the project between 1997 and 2000 has been to develop linkages between conservation of medicinal plants resources and health care development through:

(1) establishing a community-based management model of medicinal plants and
(2) building the capacities of amchis and women in primary health care.

3. BACKGROUND, CONSERVATION AND DEVELOPMENT ISSUES AT SPNP

Covering an area of 3555 sq.km, Shey Phoksundo National Park in Dolpa
district, Nepal, has a rich flora of medicinal and aromatic plants. These medicinal plants are distributed from the lower temperate forests, up to the high alpine and trans-Himalayan region. These plants are highly valued by traditional doctors (amchis) for use in traditional health care, which is based on the Tibetan medical system. Some of these species also have a high value for commercial trade, which is increasing at a high rate and represents a major threat for some species. Some 3000 inhabitants live within the boundary of the park; they are mostly of Tibetan origin and culture and follow Tibetan Buddhism or Bön religion. Bön or Bompo is an ancient religion of Tibet for which Dolpo is today a major sanctuary (Kind 1999). About 10,000 people live in the park buffer-zone areas located in the periphery. They are culturally of a mixed Indo-Nepali culture comprising ancient ethnic groups of Nepal (such as Gurung and Magar) and more Indian-related groups (such as Bhramin and Chhetri) who have migrated more recently from the lowland Terai plains of Nepal.

Health status is very poor in Dolpo due to harsh climatic and socio-economic conditions. Access to allopathic health care is almost non-existent due to the remoteness of the area. Major problems of hygiene and sanitation prevail especially due to lack of chimneys in houses and heated water (Gurung et al. 1996; Shrestha et al. 1998b). Moreover food security is also very low due to the very restricted size of agricultural lands. The local economy therefore highly relies on animal husbandry, especially the rearing of yak in high alpine pastures and trade of products between Tibet and the lower plains (Jest 1975).

Amchis, are almost the only health practitioners inside the park. Their practices are firmly grounded in the local beliefs and culture. Their status confers to them much authority at the village level not only in the field of health care but also regarding management of important livelihood resources such as pasture resources and medicinal plants collection (Ghimire et al. 1999, 2000, 2001). However, their profession is declining due to lack of formal support to the Tibetan medical system at the overall national level, lack of access to medical texts and other medical materials as well as to proper training. Based upon the concept of compassion of Tibetan Buddhism, their services are provided free of cost but this makes the profession very vulnerable in the modern context. Few young people are willing to enroll as new amchis. Amchis knowledge of the use and management of medicinal plants is extensive as is described in more details below. With this background and because health is a major livelihood issue inside the park, it was decided that this project would in its first phase (1997 – 2000) focus its activities on consolidating linkages between health care and conservation of medicinal plants resources.

The major conservation issue related to plant resources in Dolpa district is the over
harvesting of medicinal and aromatic plants (MAPs) due to trade pressure. The trade of MAPs from Dolpa has considerably increased over the last few years to very large quantities (Hertog 1995; ANSAB 1997). Amounts of raw dry products coming from localities close to SPNP were of five tons in 1992/1993, nine to twelve tons in 1995/96 and twelve tons in 1996/97 based on DFO records. Surveys conducted under this project show that some 40 tons were exported in 1996/1997 (Shrestha et al. 1998b). The Asia Network for Small Scale Agricultural Bioresources (ANSAB) conducted a survey in 1997 in Dolpa and estimated that about 80 tons were exported in 1996/1997. These figures show that there is a major gap between official figures and estimates of different trade surveys. This is due to the fact that many plants are not officially traded and that different group may use different methods for conducting the surveys. Some 22 species have been identified to be traded from Dolpa district, not all of which are officially traded (Ghimire et al. 2001). Among these species a few are listed as threatened species either under the IUCN red list, in Appendix II of CITES or restricted of collection or export by HMG. The preliminary results of this project have showed that MAPs collection was occurring at a high rate in the southern buffer zone of the park and there was a need for developing sustainable harvesting systems. People living within the boundary of the park are much concerned that the park is not able to control outsider collectors who encroach inside the park with many signs of over exploitation and collect medicinal plants for trade. If harvesting continues in the absence of sustainable practices and management, more species are likely be overexploited, threatening the resource base not only for trade but even for basic livelihood needs. Thus, there is an urgent need for improved management of MAPs at the community level integrating traditional practices and scientific information regarding their sustainability, use, sale, propagation and distribution.

After its first phase during which the project focused on the linkages between conservation and management, it is now engaged in working directly with commercial collectors in the park buffer zone to figure out ways of regulating access to areas of collection, amounts, and possible solutions.

4. METHODS AND APPROACHES

4.1. Project planning at national and field site level and returning project results

A process of planning at the national level was conducted prior to the beginning of this project and included consultation with ethnobotanists, conservation managers, manufacturers, entrepreneurs and representatives of major NGOs involved with resource management in Nepal such as ANSAB and the King Mahendra Trust for Nature Conservation (Aumeeruddy 1997). Discussions were held at a workshop by the UNESCO/
ICIMOD ethnobotany project in the Hindu Kush Himalayas held at Royal Chitwan National Park in 1996 (Shrestha et al. 1998). The site for this project was chosen with the help of WWF-Nepal Program because of: (1) its wide recognition as a being a major repository of medicinal plants of Nepal, (2) the alarming increase in trade of MAPs in the area and (3) WWF-Nepal Program’s involvement at this site in a larger integrated conservation and development project. A three-day field participatory planning workshop was held at the inception of the project in Ringmo (SPNP) in June 1997 with representatives of the National Park, local interest groups and institutions and non-government organizations such as ANSAB and Ban Udyam - Biodiversity Support Program (BSP). Numerous meetings were organized throughout the course of this project to return the results of studies conducted at the national and district levels as well as to the people in villages and to the knowledge holders, lamas and amchis aiming at reviewing results and planning project activities. This system of micro planning has helped in integrating local people’s priority and needs in the planning of all project activities.

In order to make the results more accessible at the local level, the major findings were summarized into two popular booklets in Nepali and Tibetan - also available in English. The booklets underlined major issues related to medicinal plants conservation and management in Dolpo and progress made by the project. In 2000, a training video was edited which shows the development of the project; it illustrates the close relationship between local cultural perceptions of landscapes, plant ecology and management systems and demonstrates practical methodologies (Aumeeruddy 2000). A book entitled “Medicinal Plants of Dolpo, Amchis’ knowledge, and Conservation” has been produced in close collaboration with Dolpo Amchis which aims at highlighting amchis’ knowledge relating both to management and health practices, conservation and trade issues as well as major approaches and methodologies (Lama et al. 2001).

4.2. Interdisciplinarity, work with medicinal plants resource specialists and capacity building

An interdisciplinary team consisting of botanists, sociologists, amchis, and National Park staff has worked throughout the project to conduct fieldwork to collect socioeconomic, ethnobotanical and trade information, ecological monitoring of selected medicinal plants, conduct surveys on health and all related activities. Park game scouts and local amchis were included in the project team to increase their level of participation in the project design and to build capacity for joint management of medicinal plants. Two expert amchis from Mustang, Tsampa Ngawang Gurung and Gyatso Bista, who have extensive experience throughout the Himalayas
were also associated to the field team. Training included joint field work with the People and Plants Coordinator (Yildiz Aumeeruddy-Thomas) for sociological and ethnobotanical surveys, micro-level field planning as well as design of ecological experiments and harvesting simulations. The project botanist (Suresh K. Ghimire) provided practical training to amchis and game scouts for monitoring experimental plots and conducting ecological surveys, identification of plants, collection and preparation of herbarium specimens. The project sociologist (Yeshi Choden Lama) assisted the two expert amchis for the health care side of the project. Dhirendra Parajuli (sociologist) conducted research on local institutions for pasture management and on the sociological dimension of resource use in Kunasa. Giri Tripathi (botanist) conducted a Rapid Vulnerability Assessment under the guidance of Susanne Schmitt (WWF-UK, People and Plants).

4.3. Methods for developing a community-based medicinal plants management model

Since 1998, a thorough survey of local knowledge systems and management practices has been conducted with the underlying objective of developing a community-based model for medicinal plants management. The village of Pungmo, representative of Bön/Buddhist communities of Lower Dolpo, living inside the park, was identified for developing this approach. This village is located in Phoksundo VDC. It was chosen as it is in a strategic location, its lands being the immediate area inside the park where commercial collectors of medicinal plants may pursue their collection as stocks of plants are being slowly depleted in the park south western periphery. The major summer grazing pasture of Pungmo village, Kunasa, at an altitude of over 4000 meters was identified as a resource management unit where patterns of use of medicinal plants as well as experimentation could be conducted. (Ghimire et al. 1999). Work was also initiated in some pastures located in the buffer-zone area especially in Dokpa and Mukroman, which lie at the southwestern boundary of SPNP and cover large areas encompassing both sub-alpine and alpine eco-zones. Resource harvesting and grazing still occurs as per traditional use rights. Harvesting of MAPs for trade is now a common feature in these pastures as opposed to pastures located inside the National Park, such as Kunasa.

Ehnobotanical approaches, combining natural as well as social sciences methods have been adopted to get information regarding the knowledge of local resource users on resource availability, distribution, extraction process, amount and local institutions responsible for the control over pasture resources. Experimental plots were set up for ecological monitoring of population dynamics and simulation of different levels of harvesting of two medicinal plants of high value, Nardostachys grandiflora and Picrorhiza scrophulariiflora. The experimental design
was based on information provided by amchis as well as on scientific knowledge. The project botanist conducted this part of the field activities. Field work was conducted during May/June and September/October in 1997, 1998, 1999 and 2000. During each field visit, a series of participatory meetings were carried out at the site with all interest groups.

Methods and approaches consisted in:

1. Understanding how people relate to land and landscape and how control is exercised over different resources within the village territory.

2. Once an overall picture was obtained, a unit of management was identified, Kunasa, in which detailed work was conducted regarding management of pasture resources including rotational grazing, medicinal plants collection, and grass collection for winter season, including calendar of activities of different groups using this pasture.

3. Within this particular pasture, a geographical and ethnological approach was developed to understand how people relate to different elements of the landscape.

4. Knowledge systems were examined through open interviews on the field with the specialists and through conducting quantitative surveys with a sample of lay people from the village and park personnel. Aspects of knowledge explored were: plant nomenclature and uses, plant's ecological characteristics such as distribution of plants populations in the pasture, size and importance of sub-populations, plant life cycles including local categories for designing different growth stages, techniques and practices in particular season and methods of collection.

5. Setting up research plots for the ecological follow-up of population dynamics of two medicinal plants of high value both for local use and for trade, Nardostachys grandiflora and Picrorhiza scrophulariiflora.

6. Simulating different harvesting levels of the above two species using particular techniques of selective harvesting used by the local specialists (amchis).

7. Setting up a monitoring system using local indicators (indigenous categories of plant growth stages).

8. Conducting a detailed survey of the morphology and growth pattern of the above two species.

9. Returning results to local communities and park authorities and setting up of Medicinal Plants Management Committees.

4.4. Improving local health care through capacity building of amchis and women: methods and approaches

Amchis and women were chosen as the two major interest groups because: (1)
amchis are the major providers of health care as well as being the major knowledge holders in relation to use and management of medicinal plants and (2) women are responsible of children's care and have formally expressed at the project's inception, their high interest of getting training in primary health care. Women indeed argue that although most of them cannot afford spending seven years of training to become an amchi, they still wished to acquire some basic knowledge.

The health care side of the project was approached more from a developmental perspective as compared to the above. Baseline data collection was conducted throughout the course of the project and was related to health status, diet, identifying gaps in local knowledge using the classification of diseases of the Tibetan system of medicine and in general trying to understand people's requirements related to health care. Further to baseline data collection, the project facilitated:

- the exchange of knowledge between Dolpo amchis,
- the distribution of medical texts,
- the training of Dolpo amchis mainly by the resource persons from Mustang,
- the training of women in primary health care,
- the construction of a Traditional Health Care Centre (THCC) in Phoksundo VDC,

The major aims of the THCC are: (1) to promote the amchis' profession through training of amchis at the clinic and facilitating exchange of knowledge between the amchis; (2) providing health services to the population and (3) serve as a monitoring centre for the sustainable use of medicinal plants.

A Rapid Vulnerability Assessment was conducted in 2000 to determine the list of plant species and the amounts that can be used at the THCC in a sustainable manner, to assess the vulnerability to harvesting of the medicinal plants used in the THCC and to make recommendation regarding the use and monitoring of potentially vulnerable plants by the THCC and the amchis. This survey consisted in establishing the list of plants needed at the clinic, determining with the help of the amchis, the size and distributions of the populations of each species, the parts harvested and pattern of harvesting. Species most vulnerable to harvesting were short - listed with the help of the project team, and finally surveys were undertaken on the field to check the populations of these species and determine best pattern of harvest, which may not affect the plant populations.

5. RESULTS

5.1. Indigenous knowledge and resource management

Buddhism and Bön philosophies integrated in local customary rules and local rituals have been instrumental in developing a sense of respect for forest,
pastures, mountains and the natural environment among the people of Pungmo. Moreover, the landscape is perceived as being inhabited by a pantheon of deities, nagas and demons (Iha, lu and siddhak) in the natural environment which wields power over specific areas, resources and the humans who dwell in that area. Such landscapes are often considered sacred because they are believed to be the dwelling places of these deities and many such areas represent places of pilgrimage for the community. Conservation of resources within this cultural context seems to have been relatively effective.

People of Pungmo and associated small villages (Punikha and Gomba) have been managing their resources according to customary rules that are not a matter of ad hoc decisions by individuals, but a result of decisions made at the community-level. Historically, there have been two traditional local institutions directly or indirectly related to natural resource management; they are the Dratsang (lama hierarchic institution) and the Yulgigothe (village institution headed by the customary head of the village, mukhiya) (Parajuli 1998; Ghimire et al. 1999). Today, the resource management activities of the former institution is confined to the Kunasa area (gomba area, meaning area under the control of the religious community), whereas the latter is active in Pungmo village territories. Gomba management, construction and repair of bridges, tracks, conflict resolution, resource regulation and management, public health care, public education, etc. are the major responsibilities of the Dratsang (Parajuli 1998).

Rules and regulations applied by the Gomba system are still followed to some extent by the community in the area. The establishment of the National Park and it's sole responsibility in controlling resources has to some extent discarded some of the community rules. These rules and regulations include systems like provision of fine, amount of timber and pasture resources that may be collected, practice of rituals before starting harvesting and resource exploitation activities, use of local and religious calendar for resource harvesting. Seasonal rotational grazing and harvesting of resources are followed in pasture lands. It should be noted however that although this system has existed for very long, some plants highly used locally such as Nardostachys grandiflora are not collected with the same care by lay people as compared with the amchis. Although not verified, these activities and grazing pressure may have led to a decrease in the populations of N. grandiflora in Kunasa. These rules and regulations remain, however, good examples of indigenous knowledge and practice and have, therefore, formed a starting point for the development of a formal system of community-based MAP management (Ghimire et al. 1999; Parajuli 1998).

The ethnobotanical surveys conducted throughout the project in Pungmo and
Sharing Local and National Experience in Conservation of Medical and Aromatic Plants in South Asia

elsewhere in Dolpa revealed a rich local knowledge about the resources and their management (Shrestha et al. 1998; Ghimire et al. 1999, 2000, 2001). 407 medicinal species belonging to 226 genera and 80 families have been recorded in Dolpa since 1997 (Ghimire et al. 2000). The local people have precise knowledge about the life cycles, ecology and distributions as well as harvesting and management techniques of medicinal plant species found in the area. Local amchis have a higher knowledge of plants as well as of harvesting practices than lay people. Amchis recognised more than 90% of the plants shown to them compared to 55% for lay people from Pungmo community, 35% for people from Hindu community living in the periphery of the park and 35% for park staff (Ghimire et al. 2000).

5.2. Local system of plant nomenclature

Four major types of landuse units or ecosystems are distinguished, viz: nahkri (forest land), penhri or pangri (pasture land), drakri (rocky mountains or cliffs) and khangri (snowy mountain). Some of these units are further sub-divided on the basis of their physical and morphological nature, cultural values and component species.

Similarly, local people categorize plants based on their life forms, habit and use (Ghimire et al. 1999). In addition to explicit categories which are expressed in the local nomenclature or naming system, plants may also be classified, on the basis of binary categories using current expressions such as more useful and less useful, edible and non-edible, medicinal and non-medicinal, poisonous and non-poisonous, etc. Morphological characters are most frequently used in naming a plant as well as a particular characteristic of the plant relating to use, habitat, property etc. These terms which may regroup a number of species of the same genus are generally further differentiated through the assignment of a second descriptive term which may refer to its colour, use value, properties of the plant, and habitat. Besides naming plants, local people, especially amchis, define very precisely and name the parts, biology and life cycle stages of a plant. In particular five stages of the plants life are recognized which are: seedling stage (selubarte/keyete), juvenile (dongpokeyete), young flowering (utumchadu, metokbarduk) and mature adult (kamduk, thudaichonduk). These indicators of different growth stages of plants have been used by the project for the current monitoring of ecological experimental plots, thus enabling to integrate scientific approaches with local knowledge systems (Ghimire et al. 1999, 2000).

5.3. Local practices of sustainable harvesting

The amchis and lamas have developed some concepts of sustainable harvesting of MAPs through their study of the Tibetan medical texts as well as through empirical knowledge and training from their fathers and forefathers. Having some
ideas about the limits of the stock or volume of medicinal plants available in the area, they tend to use selective harvesting practices. When underground parts are needed for medical preparations, only mature and robust plants are selected, leaving younger bulbs, rhizomes and vegetative shoots to mature and set seeds over several years. When leaves, flowers or other parts of the plants are required, limited amounts are purposely collected in order not to affect their regeneration. Such knowledge can be instrumental for designing management prescriptions.

Similarly, the harvesting stage of a medicinal plant depends on the nature of disease/disorders for which the plant is used, nature of plant parts used and type of herbal preparations. The lamas and amchis consult the Tibetan calendar and medical texts and generally proceed for harvesting after performing specific rituals prior to the collection of medicinal plants. According to the Tibetan calendar, there are four seasons of three months each in a year, during which specific parts of specific medicinal plants should be collected for better medicinal efficacy. Besides these harvesting seasons, there is a period locally known as dangsong rikhi during which medicinal efficacy is highest (Ghimire et al. 1999). This period is when the leaves have started to turn yellow in October and during which a "nectar rain" nurtures all plants. This relates to rhizomatous and bulbous species, which underground parts, are then collected as well as to grass fodder from the pastures, which are also collected at the same period.

5.4. Ecological study of medicinal plants

Transect studies have been conducted of two major species of medicinal plants which are commercially harvested outside the park viz., Nardostachys grandiflora and Picrorhiza scrophulariiflora in different habitats of the high altitude pastures. These studies revealed variation in distribution frequency and abundance between study sites in response to grazing pressure and harvesting intensities (Tables 1 and 2). The habitats in the park bufferzone (such as Dokpa, Chimla, Paile) experience heavy disturbance through resource harvesting and grazing and showed the lowest density and other population attributes of Nardostachys grandiflora compared to the protected habitats inside the SPNP (Table 1). The disturbed sites in the park buffer zone showed signs of unsustainable harvesting of N. grandiflora. It was believed that N. grandiflora was dominantly found all over these habitats a few years ago, but now it is very scarce and restricted to some steep and inaccessible slopes.

The distribution and dominance of P. scrophulariiflora in habitats within the Kunasa area varies (Table 2). Density was found higher in the relatively more disturbed site (Talgera) while frequency was highest in the less disturbed site. Although a comparatively higher density of competitive species and lower density
Table 1  Density, relative density, frequency, relative frequency, relative cover, importance value index and biomass of Nardostachys grandiflora at different sites.

<table>
<thead>
<tr>
<th>Population attributes</th>
<th>Subutong*</th>
<th>Paiile**</th>
<th>Chuniya*</th>
<th>Chima**</th>
<th>Dokpa**</th>
<th>Chakkong*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density/ m²</td>
<td>4.70</td>
<td>2.36</td>
<td>16.28</td>
<td>2.75</td>
<td>1.75</td>
<td>30.40</td>
</tr>
<tr>
<td>Relative density (%)</td>
<td>6.03</td>
<td>2.08</td>
<td>19.89</td>
<td>5.81</td>
<td>1.5</td>
<td>22</td>
</tr>
<tr>
<td>Frequency (%)</td>
<td>42</td>
<td>48</td>
<td>86</td>
<td>40</td>
<td>10</td>
<td>90</td>
</tr>
<tr>
<td>Relative frequency (%)</td>
<td>6.58</td>
<td>8.66</td>
<td>12.87</td>
<td>3.125</td>
<td>4</td>
<td>25</td>
</tr>
<tr>
<td>Relative cover (%)</td>
<td>4.54</td>
<td>2.40</td>
<td>23.23</td>
<td>10.5</td>
<td>2.1</td>
<td>25</td>
</tr>
<tr>
<td>Importance value index (IVI)</td>
<td>17.16</td>
<td>13.14</td>
<td>55.99</td>
<td>19.424</td>
<td>12</td>
<td>60</td>
</tr>
<tr>
<td>Relative IVI (%)</td>
<td>5.72</td>
<td>4.38</td>
<td>18.66</td>
<td>6.47</td>
<td>3.2</td>
<td>20</td>
</tr>
<tr>
<td>Biomass (kg/m²)</td>
<td>2.063</td>
<td>1.036</td>
<td>7.145</td>
<td>1.207</td>
<td>0.768</td>
<td>13.342</td>
</tr>
</tbody>
</table>

* Site within the national park  
** Site at the park buffer-zone

Table 2  Density, relative density, frequency, relative frequency, relative cover, importance value index and biomass of Picrorhiza scrophulariiflora at two different sites in Kunasa within the SPNP.

<table>
<thead>
<tr>
<th>Population attributes</th>
<th>Talgera</th>
<th>Phusingtong</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density/ m²</td>
<td>1.90</td>
<td>1.80</td>
</tr>
<tr>
<td>Relative density (%)</td>
<td>3.57</td>
<td>1.88</td>
</tr>
<tr>
<td>Frequency (%)</td>
<td>25.00</td>
<td>50.00</td>
</tr>
<tr>
<td>Relative frequency (%)</td>
<td>4.13</td>
<td>7.04</td>
</tr>
<tr>
<td>Relative cover (%)</td>
<td>1.39</td>
<td>0.62</td>
</tr>
<tr>
<td>Importance value index (IVI)</td>
<td>9.09</td>
<td>9.54</td>
</tr>
<tr>
<td>Relative IVI (%)</td>
<td>3.03</td>
<td>55.93</td>
</tr>
<tr>
<td>Biomass (gm/m²)</td>
<td>36.78</td>
<td>55.93</td>
</tr>
</tbody>
</table>

of P. scrophulariiflora as compared to Talgera characterize the Phusingtong site (less disturbed), the site shows higher biomass production (in terms of dry weight m⁻²). This may be due to the presence of wetter and gentler slopes with higher soil-organic matter and moisture content. Talgera site is comparatively drier with open rocky and steeper slopes. S.K. Ghimire (Ghimire et al. 2001) has undertaken detailed analysis of ecological data.
5.5. Population dynamics and harvesting simulations

There is for both species a decreasing order of ramet recruitment and survivorship with the increasing harvesting intensities. Comparatively, *N. grandiflora* showed a higher rate of ramet loss than recruitment. Thus in *N. grandiflora* the overall ratio of ramet recruitment vs. loss was comparatively lower and it decreased further with the increasing harvesting intensity. This suggests that populations of *N. grandiflora* due to it's morphology, growth pattern and possibly overall reproductive biology is more sensitive to harvesting even at very low levels of harvest. Both *Nardostachys grandiflora* and *Picrorhiza scrophulariiflora* are clonal types of plants, which spread by the multiplication of ramets (vegetative off shoots). However, the modular growths of these two plants are very different and *P. scrophulariiflora* is more successful in multiplication of ramets than *N. grandiflora* (Ghimire et al. 2000, 2001).

5.6. Health status and amchis health related knowledge

The health care needs of the people are provided by the *amchis* whose tradition of healing is based on the "Four Medical Tantras" (Gyu-shi) which is practiced in various regions of the Himalayas including India, Nepal, China (Tibet) and Bhutan. This medicine is based on the practice of maintaining equilibrium of psycho-physical processes in the body through balancing the three humors, phlegm, wind and bile. Diseases are seen as caused when wrong actions or influence of external factors upsets the state of balance: diet, climate, behavioral patterns of the individual (Donden 1996; Khangkar 1998; Lama et al. 2001). Amchis classify medicinal plants according to explicit qualities as said before. In addition, medicines and medicinal plants are also classified according to implicit qualities related to their taste and potency. All medicinal plants and materials for making medicine are said to have six tastes: sweet (*ngar*), sour (*kyur*), salty (*lentsa*), hot (*tsawa*), bitter (*khawa*) and astringent (*kawa*). In addition to the six tastes, medicines have eight powers: heavy (*chiwa*), oily (*numpa*), cool (*silwa*), neutral (*tuiwa*), light (*yangpa*), coarse (*tsuba*), hot (*tsawa*) and sharp (*nowa*) (Lama et al. 2001).

Research conducted by Yeshi Lama (Lama et al., 2001) showed that the amchis of Dolpo prepare a number of medicines using *rinpoche rik* (precious metals), *domen* (stone medicines), *samen* (earth medicines), *shingmen* (tree medicines), *tsimen* (resins), *ngo men* (plants) and *sokchag* (animal parts). The medicines locally prepared are administered as decoction (*thang*), powder (*chhema*), pill (*rilbu*), paste (*degu*) and concentrate (*khenda*). Amchis may use a variety of therapeutic techniques starting from a gentle therapy and then moving on to a more stronger therapy depending upon the nature and severity of the disease. Amchis also have mastered certain
techniques for curing illnesses through their practical experience. For example, Amchi Karma of Takkyu has cured several patients in the Tichurong area in lower Dolpo who were suffering from painful joints with *Dudtsi Ngalom*, a medicinal bath constituted mostly of medicinal plants. *Dudtsi Ngalom* (medicinal bath), *tarka metsa* (blood-letting and moxibustion), *lapchang* (radish wine with medicine), *ngabru* (horn for drawing blood), *tsukshel* (ointment for drawing lymph fluid) *kunya* (massage), *men ngak* (mantras) are also some specialized techniques used by the amchis of Dolpo (Lama et al. 2001).

During field visits from 1997 to 2000, 790 patients have been treated by Amchis Tsampa Ngawang, Gyatso Bista and by the caretaker of the Traditional Health Care Centre in Phoksundo VDC.

<table>
<thead>
<tr>
<th>Most common diseases</th>
<th>Common diseases</th>
<th>Less Common diseases</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tibetan name</td>
<td>English</td>
<td>Tibetan name</td>
<td>English</td>
</tr>
<tr>
<td>Badum, Kang ne</td>
<td>limbs pain</td>
<td>Champa</td>
<td>Chin ne</td>
</tr>
<tr>
<td>Beken phowai ne</td>
<td>gastro-intestinal</td>
<td>Dangnyen</td>
<td>Kegak ne</td>
</tr>
<tr>
<td>Champa lo gyapa</td>
<td>cold and cough</td>
<td>Datsen Shorba</td>
<td>Kegak ne</td>
</tr>
<tr>
<td>Dumbu</td>
<td>arthritis</td>
<td>Khel ne, Kheldam</td>
<td>Lo ne</td>
</tr>
<tr>
<td>Khelma/ dang ne</td>
<td>kidney disease due to cold</td>
<td>Lotse</td>
<td>wind disorders</td>
</tr>
<tr>
<td>Mashu</td>
<td>sore</td>
<td>Lung ne</td>
<td>Nawe-ne</td>
</tr>
<tr>
<td>Ngal trak shorba</td>
<td>uterine bleeding and irregular menstruation</td>
<td>Mig ne</td>
<td>eye disease</td>
</tr>
</tbody>
</table>

<p>| | | | |</p>
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<th></th>
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<table>
<thead>
<tr>
<th>Disease</th>
<th>English Name</th>
<th>Tibetan Name</th>
<th>English Name</th>
<th>Tibetan Name</th>
<th>English Name</th>
<th>Tibetan Name</th>
<th>English Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthritis</td>
<td>Khel ne, Kheldam</td>
<td>Kidney Disease</td>
<td>Lo ne</td>
<td>Wind Disease</td>
<td>Din ne</td>
<td>Throat Disease</td>
<td></td>
</tr>
<tr>
<td>Kidney Disease due to Cold</td>
<td>Lotse</td>
<td>Wind Disorders</td>
<td>Ma</td>
<td>Sore</td>
<td>Kyuk-ne</td>
<td>Nausea</td>
<td></td>
</tr>
<tr>
<td>Sore</td>
<td>Lung ne</td>
<td>Wind Disease</td>
<td>Nawe-ne</td>
<td>Ear Disease</td>
<td>Lotak shorba</td>
<td>Bleeding from the Lungs</td>
<td></td>
</tr>
<tr>
<td>Uterine Bleeding and Irregular Menstruation</td>
<td>Mig ne</td>
<td>Eye Disease</td>
<td>Pak ne</td>
<td>Skin Disease</td>
<td>Natak shorba</td>
<td>Nasal Bleeding</td>
<td></td>
</tr>
<tr>
<td>Blood, Phlegme and Bile Disease</td>
<td>Trak tri be tri</td>
<td></td>
<td></td>
<td></td>
<td>Pho ne</td>
<td>Stomach Disorders</td>
<td></td>
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</tbody>
</table>
### Health Care Development and Medicinal Plants Conservation at Shey Phoksundo National Park, Nepal

<table>
<thead>
<tr>
<th>Most common diseases</th>
<th>Common diseases</th>
<th>Less Common diseases</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nyen ne inflammations, nyen swel</td>
<td>Infection, nyen</td>
<td>Tsawa infection, fever and</td>
<td>Photsen disease, male organ</td>
</tr>
<tr>
<td>Nyingne</td>
<td>heart disease</td>
<td>Tsik, joints disease</td>
<td>Sin, infection induced by microorganism</td>
</tr>
<tr>
<td>Pagne</td>
<td>scabies</td>
<td>Uk me dewa, breathing disorders</td>
<td>Sog lung, mental illness</td>
</tr>
<tr>
<td>Ruchak ne</td>
<td>bone fracture</td>
<td></td>
<td>Tesin ne, ache around the navel</td>
</tr>
<tr>
<td>Soglung</td>
<td>mental illness</td>
<td></td>
<td>Traklung, blood (wind) disorders</td>
</tr>
<tr>
<td>Sone</td>
<td>toothache</td>
<td></td>
<td>Tsa ne, nerve disease</td>
</tr>
<tr>
<td>Takshe thowa</td>
<td>high blood</td>
<td></td>
<td>Zadip ne, nerve disease pressure</td>
</tr>
<tr>
<td>To truk ne</td>
<td>upper body ache, chest ache</td>
<td></td>
<td>Ze-mashuwa, indigestion</td>
</tr>
<tr>
<td>Trak lung ne</td>
<td>blood and wind disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tripa</td>
<td>bile disease such as jaundice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trugu kye ne</td>
<td>childbirth related disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truk lo and Lone</td>
<td>chronic cough</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tsakar tsa ne</td>
<td>nerves disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tsawa</td>
<td>fever</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ug ne</td>
<td>asthma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yama</td>
<td>sinus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bume ne</td>
<td>female disorders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yama go ne</td>
<td>headache</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yasin gi sone</td>
<td>tooth ache</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Za ne</td>
<td>epilepsy</td>
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Detailed causes, symptoms and treatments for these diseases have been identified by Amchi Tsampa Ngawang (Ghimire et al. 1999).

In comparison to the above, common diseases recorded at the District Health Post in Dunai (District headquarters) were found to be diarrhoea, worms infection, skin disease, chest infection, wounds, cuts, injuries and fractures, gastritis, conjunctivitis, bleeding (P.V.), tonsillitis (Shrestha et al. 1998b).
Sharing Local and National Experience in Conservation of Medical and Aromatic Plants in South Asia

(Shrestha et al. 1998; Ghimire et al. 1999, 2000, 2001). Diseases encountered during that period are classified according to most common diseases, common diseases, less common diseases and others are given in the table below. These diseases names follow the Tibetan classification of diseases which relate to problems of imbalance between the three humors namely tripa translated as bile, badkan as phlegme and lung as subtle vital energy and more currently known as wind disease. It is therefore very difficult to make a strict equivalence between Tibetan diseases classifications and allopathic diseases classifications. It is also important to note that amchis do not only treat the symptoms of the diseases but also address behavioural and psychological patterns related to the disease. The descriptions of the diseases below have been provided by the expert amchis and were transcribed by the project sociologist. It is in no way the result of diagnosis by an allopathic doctor. All prescriptions given at the THCC have been kept in the record book of the THCC since its inception.

Transfer of knowledge and recent changes

In Dolpo, as elsewhere in the Himalayas, the amchis are scattered across remote villages where often they are the sole providers of health care services. Most Dolpo amchis learn the medical practices from their fathers and forefathers and very few can afford to go to formal medical schools. They learn curative properties through years of intensive study of the “Gyu-shi” and other medical texts including training and practice under the guidance of an experienced amchi. Much of the training also includes identification of plants in the field, sustainable harvesting of the necessary plant parts, and preparation of the medicinal ingredients into remedies to treat a wide range of illnesses. However, according to Dolpo amchis this knowledge has been declining in recent years due to problems such as the lack of resources to buy medical texts and raw materials to make medicine, restrictions on plant collection and use, and lack of adequate training in cultivation, collection and storage of medicinal plants (Shrestha et al. 1998b).

The surveys conducted by Gurung et al. (1996) and by this project shows that learned amchis of Dolpo are all above 50 years old. The knowledge that they hold represent the best as acquired from the medical texts and their experience with the local environment and situation. A major issue for the amchis is the transmission of this knowledge to able and motivated youth that can continue to uphold this unique and relevant tradition of healing (Lama et al. 2001).

In order to facilitate exchange among the amchis, a workshop of Dolpo amchis was organized in June 1998 during which more than 50 amchis from Shey Phoksundo National Park and other parts of the district gathered to share knowledge and to discuss what aspects of their knowledge
may be safely transferred to the women in order to improve health care. Based on these initial discussions and those at subsequent workshops in 1999 and 2000, the amchis have now provided a list of medicinal plants that can be used singularly to treat common ailments by following simple processes (Ghimire et al. 2001).

At the inauguration of the THCC in June 2000, amchis from Saldang, Bijer, Dho and Phoksundo VDC discussed classification of plants, their properties and uses and the transfer of knowledge to women.

As part of the capacity building activities for amchis, important texts on medical theory, plant identification and preparation of medicine were also distributed among the amchis at the workshop. Amchis from the neighboring district of Mustang provided a series of training in medical theory, diagnosis and therapy.

Regarding women, a survey was conducted in 1998 to assess women's diet, health status and general knowledge relating to use and management of medicinal plants. This survey was conducted on a very small sample of women from Pungmo. Following this survey, discussions were held with Dolpo amchis to decide upon aspects of their knowledge that could be transferred to women. Following Dolpo amchis' and the resource persons' advices, a Primary Health Care Training Manual was produced for training women based on which a series of training in primary health care have been provided to about 100 women of Phoksundo VDC by the Resource Persons and by health care workers.

A major decision taken by Dolpo amchis since the beginning of this project has been to re-inforce their profession through the setting up of a medical centre, the THCC in Phoksundo VDC (Gangchen Menkhang). It is felt by amchis that as a group they will have more visibility and also may have more chance to obtaining formal support. The THCC is also seen as an opportunity to create incentives for younger people to become amchis. Moreover in the context of a clinic, the amchis receive a salary and are not paid directly by the patients. However the clinic also generates some small benefits through fees given by patients and donations. Following this experience in Phoksundo, Upper Dolpo amchis from their own initiative started a new clinic in Dho Tarap. They were further contacted in 1999 by the Remote Area Development Committee of the Ministry of Local Development which has provided training on sustainable harvesting practices and support for forming associations in remote districts and consequently formed an association of amchis in Upper Dolpo. This project has played a role in helping both the THCC in Phoksundo and the association of amchis of Upper Dolpo in reflecting of issues of sustainability of medicinal used at the clinics.
A Rapid Vulnerability Assessment undertaken by Tripathi and Schmitt (Ghimire et al. 2001) shows that 24 out of 136 species needed by the traditional health care centre are potentially vulnerable to harvesting. The result of the scoring shows that there are varying levels of vulnerability. Medicinal Plants Management Committees following the operational plan of the THCC that is being finalized will conduct the monitoring of these species.

6. PROJECT IMPLEMENTATION: A COMMUNITY-BASED MANAGEMENT MODEL FOR MEDICINAL PLANTS

Implementation in the context of Shey Phoksundo National Park has implied the building of new institutions such as MPMCs and the THCC which draw upon existing customary institutions. Success also lies in finding processes for enabling transfer of knowledge between specialists.

*Fig 1 below shows the interaction between the different components of the project.*
Health Care Development and Medicinal Plants Conservation at Shey Phoksundo National Park, Nepal

(amchis) and younger people as well as to women. Implementation is founded on a research component, which provides results for developing management guidelines. Finally because many groups are present with diverging perspectives and perceptions it is important to build linkages between different interest groups such as between the National Park and the Amchi Association (THCC) and village-level committees (MPMCs).

A pilot Medicinal Plants Management Committee was set up in Pungmo village in order to advise and monitor the impact of use of medicinal plants, both by the THCC and by villagers. Such committees will be formed in other villages of Phoksundo VDC and in the buffer zone south of the Park.

Conclusion and lessons learnt

This project has made an attempt to reinforce linkages between traditional health care in Dolpo and the sustainable use of medicinal plants. It has been instrumental in exploring amchis' knowledge and integrating this knowledge for the development of new institutions aiming both at development of health care and conservation of resources.

The major threat issue, which is harvesting for trade has not yet been fully addressed. Experience gained however through working with Dolpo amchis will hopefully guide further activities with a new stakeholder group which are the trade collectors. In particular it is hoped that some aspects of amchis' knowledge related to management of resources and experiments on the harvesting of medicinal plants could also benefit trade collectors.

Major lessons learnt from this project to date are:

- Consultation of all interest groups at national and at site levels has led in major changes in project design, in particular proper identification of major interest or user groups, full consideration of a local livelihood need, health care, including the construction of the THCC and involvement in the training of women in primary health care which were not initially planned.

- Including local persons and park staff in the research team has enabled the transfer of local amchis' knowledge to park staff especially regarding, identification, distribution and harvesting techniques and has subsequently re-inforced the capacity of both these groups in monitoring. The interest of park staff in learning has shown to the local people that cooperation with the National Park could be envisaged.

- Identifying and understanding local institutions help in conceiving new institutions which are locally well grounded and which may integrate new factors such as the need for transfer of knowledge or for joint management.
Baseline ethnobotanical surveys conducted in a participatory manner by a multidisciplinary team provide relevant information (such as information on multiplicity of uses, amounts used, geographical locations of resources, harvesting practices) for designing conservation programs.

Returning of results to the community in the form of popular booklets and field workshops has enabled participatory planning and adaptive management of project activities. Returning results at the national level is equally important in order to share experience and disseminate lessons learnt.

Integrating local indicators for the monitoring of ecological plots has constituted an integrative approach of scientific and traditional knowledge, which will benefit both local communities and science.

Much work on use pattern, ecology, growth rate and conservation status remains to be done on sub-alpine and alpine species.

The amounts of MAPs traded and trends in their trade need to be monitored to assess the level of threat for a species.

Morphological studies especially relating to the growth patterns are essential to develop sound guidelines for the harvesting of medicinal plants.

Both long term research (such as ecological monitoring) as well as short-term assessments (e.g. RVA) is necessary. A research component is needed to provide sound data for making decisions and developing sound guidelines.

Long term sustainability of the project lies on capacity building and long term monitoring. It is thus important to have some flexibility in the duration of projects; especially that project timing fit with local time pace and calendar rather than the contrary.

Acknowledgements: The authors are grateful to IDRC/MAPPA for the invitation to attend the Regional Workshop, Pokhara, Nepal

References


Ex-situ Conservation of Medicinal Plants by Backyard Home Garden for Primary Health Care in Bangladesh

Ferdousi Begum

ABSTRACT

Bangladesh possess rich flora of medicinal plants, which grow in widely distributed forests, pastures, wastelands and roadsides. Although more than 500 medicinal plants have been reported to occur in Bangladesh, none of them have so far been systematically cultivated for medicinal purposes. Suppliers of the local Ayurvedic, Unani and Homeopathic drug manufacturers collect the medicinal plants from the wild habitats. These are, sometimes, so indiscriminately exploited that many important medicinal plants like Rauvolfia serpentina and Andrographis paniculata are now under the threat of extinction. In fact these are now available only sporadically. This is a very alarming situation with regard to natural growth of medicinal plants in the wilderness in this country. Appropriate steps must therefore be taken immediately in order to save this situation with regard to growth, conservation and documentation. In a country like Bangladesh, where the majority of people are not wealthy, low cost and safe care is essential. Traditional systems of medicine are therefore familiar to us, like old friends whom we should re-acquaint ourselves with. Unfortunately, these traditions have been largely eradicated because of lack of support and recognition as well as the rapid destruction of natural habitats, which have led to a shortage of medicinal plants. Self-reliance and self-help in basic primary health care has therefore become a key requirement that needs to be fulfilled so that the citizens can lead a healthy life. This self-reliance can be achieved easily on low-cost basis by reviving and popularizing simple and effective trade optimal methods of treating common diseases based on the use of medicinal plants to build up backyard home garden which is an integral part of our indigenous medicinal knowledge system. Our grandfathers and grandmothers are the carrier of this knowledge, but today we are not conserving this knowledge but gradually loosing them. Conservation and cultivation of 24 species of medicinal plants are being carried on at South Maguri village of Luxmipur district. These medicinal plants are being used locally to alleviate many of the frequently occurring disease and ailments.
Introduction

The plants that possess therapeutic or exert beneficial pharmacological effect on the animal body are generally designed as "Medicinal plants". Plants having secondary metabolites like alkaloids, glycosides, tannins, volatile oils, minerals and vitamins posses medicinal properties.

Medicinal plants have been playing significant roles in providing primary health care services to most rural people. They also serve as important source of raw materials for the manufacture of traditional and modern medicines. Export of medicinal plants and their products earn substantial amount of foreign exchange, playing a significant role in the rural and national economies. In Bangladesh, huge quantities of medicinal plant materials and extracts are being imported for the manufacture of Ayurvedic, Unani and Homeopathic medicines. Many of these plants are be available in the wild, major part of which still remains to be surveyed systematically.

There are more than 300 Ayurvedic and Unani drug manufacturing companies in the country producing some 500 types of herbal drugs. About 250 species of medicinal plants are used in these preparations most of which available in the country while considerable quantities imported from neighboring countries.

The present communication introduces the initiatives taken to encourage the backyard home garden program and establishment of a network of medicinal plant nurseries.

Objectives

- Conservation of endangered medicinal plant species as a part of biodiversity conservation,
- Documentation of indigenous knowledge on medicinal uses of plants,
- Encourage commercial cultivation of medicinal plants to meet the growing demands.

Methods

- Motivate different stakeholders including local communities through seminars, symposia, workshops and various other communication media,
- Group meeting and discussions for motivation,
- Training of rural women,
- Preparation of backyard home garden for selected species used in primary health care services,
- Supplying planting materials to the rural communities, especially the women communities,
- Monitoring and evaluation of the activities being conducted.
Activities and Achievements

Documentation of Indigenous Knowledge

The indigenous herbal knowledge available in south Maguri village has been documented with the assistance of different Hakim, Kabiraj, and aged people and other traditional herbal healers.

The Home Herbal Garden Program

Our initiative in boosting the use of medicinal plants in primary health care involved promoting home herbal garden program and establishing a network of medicinal plant nurseries. As women are highly concerned with the healthcare problems of the family and work as family physicians by using medicinal plants, this program has received their active participation to conserve the wild medicinal plants in their environment.

Villagers are encouraged to obtain medicinal plant seedlings from Development of Biotechnology and Environmental Conservation Centre (DEBTEC) nurseries and plant them in their sites. Village women have also been suggested to collect seeds and other planting materials for their home gardens.

Rural peoples are being increasingly convinced that the commercial scale cultivation of medicinal plants is more profitable compared to the conventional cash crops, and medicinal plants could gain the status of cash crops.

The Home Garden Campaign has promoted sustainable utilization of selected medicinal plants in the wild, as they are available in the backyards for immediate uses. Kitchen items like spices, vegetable, fruits and even some weeds, all having medicinal virtues, have been included in the list of plants in the home gardens.

Conservation

For ex-situ conservation, 20 backyard home gardens have been developed at South Maguri village of Laxmipur district, mostly using the wastelands. Beds of different sizes were prepared for the plantation and 24 species of medicinal plants have been conserved following the backyard home garden concept.

Acknowledgements: Medicinal and Aromatic Plants Program in Asia (MAPPA), International Development Research Centre (IDRC) is gratefully acknowledged for the financial assistance provided for the smooth running of the present project. Invitation to attend the Regional Workshop at Pokhara, Nepal is also highly acknowledged.
Developing Methodologies for Sustainable Management of High Value Medicinal and Aromatic Plants in Jumla District, Nepal

Sunil Regmi
Sagun Bista

Background

More than 100 species of Non-timber Forest Products (NTFPs) are harvested from the middle hills and high mountains and are mostly traded to Indian markets. Most of the high value Medicinal and Aromatic Plants (MAP) are collected from government managed forest, where scientific resource management system is not practiced. Cultivation of MAPs in private land and domestication in community forests are not conducted because of lack of adequate technical knowledge. Unsustainable management practices for Medicinal and Aromatic Plants (MAPs) and increasing market demand encouraging intensive overharvesting are leading to a decrease in the diversity, quality and availability of MAPs in Nepal’s high hills. The consequences are serious for plant biodiversity and for local harvesters who depend on the trade of MAPs to meet their basic economic needs. Very little information is available in Nepal on best management practices of MAPs, which includes good harvesting and cultivation practices in community forests and on private lands. There is a need to develop common methodologies for sustainable use of endangered and high value medicinal and aromatic plants in the high hill districts of Nepal.

To promote the conservation of MAPs and to encourage sustainable management of MAP resources by local users in Jumla, the Canadian Centre for International Studies and Cooperation (CECI) conducted a research project (1999-2001) *Developing Methodologies for Sustainable Management of Endangered and High-value Medicinal and Aromatic Plants in Jumla*. The project has been supported by Medicinal and Aromatic Plants Program in Asia (MAPPA), an initiative of International Development Research Centre, Canada and Ford Foundation.

The project aims to develop best management practices including good harvesting technique, proper harvesting time for NTFPs, domestication and cultivation of NTFPs in Community Forests and Private Lands. The project has documented the indicators for best management practices, has explored the domestication in community forests and cultivation in private lands and is preparing an extension package for the
Developing Methodologies for Sustainable Management of High Value Medicinal and Aromatic Plants in Jumla District

local communities on the management and use of MAPs.

Introduction

Medicinal and Aromatic Plants represent an important source of income in the Karnali Zone of Mid-western Nepal, where economic opportunities are severely constrained by low socio-economic indicators and poor communication infrastructure, including the absence of road. Unsustainable management practices for Medicinal and Aromatic Plants (MAPs) and increasing market demand encouraging intensive over-harvesting are reducing the diversity, quality and availability of MAPs in the Karnali zone in general and Jumla district in particular. The consequences are serious for plant biodiversity and for local harvesters who depend on the trade of MAPs to meet their basic economic needs.

CECI/CBED Project

Canadian Centre for International Studies and Cooperation (CECI) is an organization active in developing countries since 1958. Its main sectors of intervention are community based economic development, social development, and human rights and good governance. CECI has been operating in Nepal since 1987. The mission of CECI-Nepal is to contribute to poverty alleviation through empowerment and capacity building of civil society. The priority sectors for its national programs are sustainable community economic development, natural resource management and also crosscutting themes like gender and good governance.

The Community Based Economic Development Project (CBED) is a bilateral project of the Canadian International Development Agency (CIDA) and His Majesty’s Government of Nepal (HMG/N). The CBED Project is implemented by CECI in partnership with three Nepali professional NGOs. These partners are Centre for Environment and Agricultural Policy, Research, Extension and Development (CEAPRED) for Baitadi, Developme5nt Project Service Centre (DEPROSC) in Dadeldhura and Centre for Self-Help Development (CSD) in Jumla.

CBED is an economic development project operating in the remote districts of Baitadi, Dadeldhura and Jumla. The project aims to improve local economy and to strengthen civil society through promotion of community-based organizations (CBOs). Its primary objective is to build capacity of CBOs (Savings and Credit Organizations, Forest User Groups and Farmers Association) so that they can function as viable institutions, effectively managing natural resources, improving socio-economic conditions in the community, and interact with local and district government agencies as well as local and regional market operators. These CBOs provide specific services and benefits although each type of CBOs are different in nature.
but all are meant to complement each other.

Community Forest User Groups (FUGs) are one type of the economic CBOs strengthened under the existing forestry component of CBED. The general objective of the forestry component is to support the formation and strengthening of the CFUGs so that they are capable of effectively managing and marketing the forest products. The specific objectives are:

- to strengthen CFUG institutional capacity and vision for sustainability
- to promote the income generation by CFUGs, and
- to strengthen the capacity of CFUGs to address the legal issues.

Sustainable utilization of NTFPs could be a good source of income to make FUGs viable and provide more benefit to the local collectors. Considering this possibility, CBED has accomplished a number of studies on NTFPs in Jumla in collaboration with other organizations.

The concept of community forestry was developed by the Ministry of Forest and Soil Conservation in order to improve the management of forest resources used as fuel and fodder. Therefore CFUGs were primarily created to ensure a source of fuel wood and fodder consumption oriented subsistence products of particular concern to women. However the role of CFUGs can potentially extend beyond ensuring the effective and sustainable management of the community forests. In particular there is tremendous potential for CFUGs to generate income from the sale of non-timber products including MAPs.

In order to promote sustainable management of MAPs in Jumla district, CBED has successfully conducted a number of studies in different aspects of NTFPs. In 1997, CBED conducted an inventory of four high values NTFPs like Jatamansi (Nardostachys grandiflora), Sugandhawal (Valeriana jatamansii), Kutki (Neopicrorhiza scrophulariifolia) and Padamchal (Rheum australe) in Jumla district as a first step towards the sustainable management of NTFPs. The primary objective of this research was to test the inventory methods in the field and to assess the availability of the selected NTFPs in the district.

In 1999, CBED conducted a study on “Sub-sector Analysis of High Altitude NTFPs in the Karnali Zone” under HMGN/CIDA/DANIDA funding. This study identified three key issues for intervention:

a. increasing sustainable supply of high value NTFPs,
b. increasing competition among traders in the principal trade centres like Nepalgunj, and
c. improvements in policy leverage.

The identified opportunities for leveraged interventions were assigned high, medium and low feasibility ratings. The
opportunities deemed as highly feasibility were:

- Improving the supply the NTFPs through management and sustainable harvesting, including the handing over of right over NTFPs to CFUGs, and
- Increasing CFUGs the legal awareness and capacity and improving the market information system.

The key recommendations that emerged from the Sub-sector Analysis are:

a. Re-examine the ban on the raw export of some NTFPs
b. Local level value addition/processing by the CFUGs should be prioritized
c. CFUG members should be made aware of the NTFP related legal issues, and their rights and responsibilities, and
d. The benefits of improved market intelligence and price information should be available to the grassroots stakeholders.

In 2000, CBED completed a study on "Institutional Assessment of Organizations Providing Support to Forest Enterprises in Nepal and Financial Appraisal of Forest User Groups". Based on the findings of the study and discussion with different stakeholders of the forestry sector, the following recommendations were made:

a. identify and prioritise interventions
b. network and coordinate the forest resources programme at CFUG, government and supporting agencies levels, and
c. streamline support to entrepreneurs through service providers based on an agreed mechanism of implementation.

IDRC/CECI/CBED Project

Currently, CBED is implementing the research project "Developing Methodologies for Sustainable Management of Endangered and High Value Medicinal and Aromatic Plants in Jumla District of Nepal". The objective of this study is to develop methods for best management practices of MAPs and to initiate cultivation of these species in the community forests and private farms and to disseminate successful message to stakeholders at the local, national and regional levels.

Local users and farmers are actively involved in the research activities like site selection, MAP species selection and data collection from the research sites. The four prioritized MAP species selected for research and management is *Nardostachys grandiflora* (Jatamansi), *Valeriana jatamansii* (Sugandhawal), *Neopicrorhiza scrophulariifolia* (Kutki) and *Rheum australe* (Padamchal). The effect of different harvesting practices on these plants, and studies on possibilities of cultivation of these MAPs in Community Forest and Private Farms are
being critically studied and the final result of the research is expected to get soon.

**Results obtained so far**

- CBED completed the inventory of four high value non-timber forest products in Jumla and assessed the current stock of the selected NTFPs quantitatively.

- CBED successfully conducted a study on NTFP sub-sector in the Karnali Zone of Nepal with an objective to increase the stakeholders' knowledge. A report has been published with emphasis on marketing issues, and identified issues for intervention and/or further investigation.

- CBED has developed a training manual on NTFP management, marketing and cultivation. A booklet "Alternative to Conservation: NTFP Management and Cultivation" has been published in Nepali language and made available to the CFUGs and other organizations working in NTFP sector.

- Traditional management system of NTFPs in Jumla district has been documented. Effect of different harvesting practices on regeneration and yield of plant has been identified. Cultivation potentials of these MAPs are being studied.

- The most encouraging achievement of the on-going research project is that the local communities are encouraged to cultivate the MAPs under research in their community forests and private land.

**Acknowledgements:** CECI/CBED is grateful to IDRC/MAPPA for the Medicinal Plant project in Jumla. The authors also acknowledge the invitation to attend the Regional Workshop, Pokhara, Nepal.
Action Research on Non-timber Forest Products in Central Mid-hills Region, Nepal

Damodar P. Parajuli

Introduction

The present paper is based on the experiences gained by the SAFE Concern during implementation of the action research project on medicinal and aromatic plants in the field level. This is a three-year duration project being funded by Medicinal and Aromatic Plants Program in Asia (MAPPA), an initiative of International Development Research Centre (IDRC), Canada and Ford Foundation. The project activities formally started on November 1999 considering two researches and implementation sites, Dhungkharka and Nala-Tukuche Village Development Committees (VDCs) of Kabhrepalanchok district, central Nepal.

Before the present project was initiated, SAFE-Concern carried out the socio-economic survey in the proposed project area, which revealed that 90 percent of the males and cent percent of the females were involved in agriculture with arable land. The survey also revealed that only 20 percent of the respondents had khet (rice producing arable flat land). 42.5 percent of the respondents had less than five ropani (0.25 ha.) of kharbari (grazing land with the dominance of thatch grass, Saccharum sp.) and 2.5 percent of them hold as high as 20 ropani (1 ha.) of kharbari. It was, therefore, concluded that there was immense potentiality for introducing non-timber forest products in these kharbaris that could provide them additional income. All the respondents showed willingness to domesticate and cultivate the NTFPs in their kharbaris, wasteland, community forest and even in their private land.

Sixty-four species of medicinal and aromatic plants (MAPs) having commercial viability and local uses have been documented from the project sites that are being used for various purposes by the people of these two VDCs. The surveys also revealed that majority of the respondents were somewhat familiar with only few medicinal and aromatic plant species available in their surroundings and were basically ignorant of the their potentials. All the respondents were willing to know more about the NTFPs found in their locality and their potentials as an economic resource.
Objectives of the project

The project has been implemented with the broad aim to uplift the rural economy through sustainable management of medicinal plants and other NTFPs in the Mid-hills region of Nepal. Objectives of the project are:

1. To create awareness among local people regarding importance of MAPs and other NTFPs through education and training programs about conservation approaches, forest environment and bio-diversity enrichment.

2. To find simple technology in increasing the production of medicinal plants to meet increasing demand of raw materials by local users and industry.

3. To plant suitable medicinal plants in forests managed by local community, leasehold forest and private lands to supplement the capacity of the wild resources.

4. To develop local partners/NGO’s to support private farmers and forest user groups (FUGs)

5. To generate supplementary income to uplift the socio-economic conditions of the rural people by producing valuable resources and developing appropriate and scientific harvesting regime of medicinal plants and other NTFPs in the mid hills region of Nepal.

Activities carried out so far

Keeping in view the local needs, the following 7 activities were prioritized for the successful implementation of the project:

- Documentation of baseline data/information
- Training and Extension Programs
- Nursery and Plantation Programs
- Harvesting Technology Development
- Market Study and Analysis
- Networking Activities
- Monitoring and Evaluation

The following are the major on-going activities of the project:

1. Awareness creation on the importance of medicinal plants and other NTFPs in the rural areas.

2. Training to the FUG members and local farmers on the cultivation, vegetative propagation, domestication, management and harvesting of the NTFPs in their locality.

3. Study tour to FUG members and local farmers particularly focusing on processing, value addition and marketing of the NTFPs.

4. Research, technology generation, through establishment of various trial
plots and experiments both in the nursery, community forests and the individual households.

5. Transformation of the research results and new technologies developed in other areas that are relevant to NTFPs to the local communities.

6. Production and distribution of seedlings of the species having high value of non-timber products like Dalchini (Cinnamomum tamala), Lemongrass (Cymbopogon citratus), Himalayan yew (Taxus wallichiana) for massive plantation both in the community forests and private land.

**Major activities/achievements**

SAFE Concern has produced a training manual in simple Nepali language, prepared in consultation with concerning experts. Three NTFP oriented training programs have so far been conducted involving about 100 local participants with a considerable proportion of women participants.

The NTFP focussed training program prioritized on providing information on in-situ and ex-situ conservation, cultivation, sustainable management in the wild, nursery management, local level value addition, storage and treatment of seeds and products, marketing, NTFO related laws and regulations, ethno-botanical uses, observation tours, etc.

The project started with the construction of two MAP/NTFP nurseries, one each at the research sites namely Nala and Dhungkharka. These were meant to produce economically important MAPs planting materials for the local communities to plant in community forests and private lands. Both the nurseries are well equipped with skilled nurserymen. Presently, important NTFP species being developed and maintained in the project nurseries are:

Amala (Phyllanthus emblica), Bojho (Acorus calamus), Bhyakur (Dioscorea deltoides), Chamomile (Matricaria chamomilla), Churi (Aesandra butyracea), Dalchini (Cinnamomum tamala), Sugandha Kokila (Cinnamomum glaucescens), Kurilo (Asparagus racemosus), Lemongrass (Cymbopogon citratus), Loth Salla (Taxus wallichiana), Sugandhawal (Valeriana jatamansii), Timur (Zanthoxylum armatum), etc. These nurseries are also serving as demonstration plots besides supplying necessary planting materials to the communities.

A network was formed among different CFUGs, organizations, projects, etc. to exchange experiences, materials and information sharing among member FUGs for the promotion and marketing of MAPs and other NTFPs. The prominent member organizations in the network are Herbs Production and Processing Co. Ltd. (HPPCL), Asia Network for Small Scale Bio-resources (ANSAB), Nepal Agroforestry Foundation (NAF), Institute of Forestry (IOF), etc. The project has
Sharing Local and National Experience in Conservation of Medical and Aromatic Plants in South Asia

facilitated in coordinating with HPPCL and other herbal processing companies for the sale of the raw and semi processed NTFPs the villagers produced. The community members are now able to find potential markets and buyers for their specific products.

Lessons learned

1. The human capacity must be greatly strengthened for managing MAPs through education, information dissemination, practical training, observation tours, etc.

2. The strategy for promoting MAPs must be based on people's need so that they are motivated to participation, since participation of the beneficiaries is a must for the success of any program including the conservation, cultivation and management of NTFPs.

3. The action research needs to explore the various possibilities on creating economic incentives for effective conservation of the locally available NTFPs by local communities.

4. The mechanism for monitoring of the implementation of action research activities must be built in the project document itself for quality outputs and transparency in implementation.

5. The project must facilitate people in initial stage in finding the markets for their products (raw, semi processed and processed). A systematic marketing initiative could be developed forming a cooperative so that people can work together as an institution rather than as an individual.

Acknowledgements: SAFE Concern is grateful to IDRC/MAPPA for the on going Medicinal Plant project. The author also acknowledges the invitation to attend the Regional Workshop, Pokhara, Nepal.
Resource Base and Conservation Strategies of Medicinal and Aromatic Plant in Pakistan

Zahoor Ahmad
A. Ghafoor* 

Introduction

Due to wild climate, geographic and latitudinal variation, Pakistan is endowed with rich resource base of flora and fauna. Estimates of number of medicinal plant species vary greatly from 3200 species end of the spectrum to 1000 at the lower end. (Ahmad and Siraguddin 1996). According to reports from National Institute of Health, approximately 80% of the population are benefited from herbal medicine and about 400 plant species are used extensively in traditional medicines. Although Government of Pakistan has actively promoted allopathic medicine, it has come to the realization that the traditional systems also have a key role to play, particularly with regard to primary health care. Although the dominant traditional system of medicine in Pakistan is the Unani System but in few areas, Amchis and Sanyasis are the hereditary practitioners of somewhat secret medicinal systems, which are basically Ayurvedic in nature. The tribal peoples in Pakistan don’t appear to have developed major systems of medicine, utilizing instead the Unani system. However, they have contributed a valuable knowledge base of local plants, though the efficiency of these has not yet been scientifically studied. The hakims or traditional practitioners are primarily concerned with the medicinal plants as opposed to their occurrence and distribution (Shinwari et al. 1996).

Requirements of medicinal plants reach to collectors via dealers in local names. The collectors are normally nomadic tribes who graze animals that are predominantly women. This is manifested in increasing tendencies to over collect on an unsustainable basis, and ignorance of the need for seasonal collection of particular material. The increasing shortage of medicinal plant supplies was highlighted during a conference organized by National Institute of Health, Islamabad in 1991 as well as two different workshop/symposia organized by Pakistan Agriculture Research Council (PARC) in 1996. The causes of this were largely attributed to

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over collection, over grazing, and cutting of tree for fuel wood, as well as over population in some areas.

Distribution of Medicinal Plants

The total area of Pakistan is 87.98 m ha, out of which 88% have been classified as arid and semi arid zones. The area covered by forest is 4.579 m ha (5%) out of which 1.958m ha is under temperate conifer forest and 1.702m ha under subtropical forest. Most of the medicinal plants used in commercial quantities occur mainly in four ecological regions i.e. Alpine and high altitude, temperate montane forest, and subtropical foothills forests and arid and semi arid scrubs.

Alpine and High Altitude Areas

Most of the medicinal plants are collected moist alpine and high altitude areas especially from the northwestern valleys. Most of the medicinal plants growing in these areas are slow growing perennial species, which require several years of vegetative growth for reproduction through seeds. Most of these medicinal plant species occurring in this zone are likely to be subjected to threatened or vulnerable status if the current rates of their collections continue. Endangered plant species of this area includes Podophyllum hexandrum, Saussurea costus, Picrorrhiza kurrooa, Aconitum heterophyllum and Corydalis spp.

Medicinal plants of Temperate Montana Forest

The second largest category of medicinal plants is collected from Dry Mountain areas (Karakoram and Hindu Kush). These forests went through two major structural changes during the last 100 years and the potential forest are has reduced to about 50%. The common medicinal plants of this area are Atropa acuminata, Angelica sp., Paeonia emodi, Geranium wallichianum, Artemisia spp., Glycyrrhiza glabra and Ephedra spp.

Medicinal plants of Sub- Tropical Foothill Forest

Subtropical foothill forests are spread over an area of about 1.702 ha. Himalayan foothills are most important areas for species diversity. The species found here include Terminalia spp., Mallotus philippensis, Phyllanthus emblica and Butea monosperma.

Medicinal plants of Arid and Semi Arid Areas

The cold arid areas are mainly located in the Hindu Kush and Karakoram Mountains in the north of the country. Some important species of medicinal plants of commercial importance like Artemisia spp., Ephedra gerardiana, E. procera, Bunium persicum, etc. are found in this zone.

Threatened Medicinal and Aromatic Plants of Pakistan

Although statistics on the degree of endangerment of species across different provinces, ecology and climates do not exist about 700 species of the flora of Pakistan are estimated endangered. Despite the lack of statistics, there is over
whelming agreement among exports in the country that the most threatened ecosystems are temperate forests in the upland areas. One example taken from the Swat region vividly illustrates this as shown in Table 1. This is also justified by the observed rapid loss of arid forest ecosystems in protected area in Baluchistan. The other ecosystems under threat with regard to medicinal plants are the desert areas.

Table 1. Medicinal Plants and their status in the Forest Ecosystems of Swat

| Total number of Medicinal Plant species | 350 |
| Number of Endangered Medicinal Plant species | 5 |
| Number of Threatened Medicinal Plant species | 16 |
| Number Vulnerable Medicinal Plant species | 18 |
| Number Rare Medicinal Plant species | 10 |

Source: Ahmed and Sirajuddin 1996

Conservation of Medicinal Plant Resource Base

Although various efforts for conservation and sustainable utilization of medicinal plant resource base has been undertaken but not with much impact. The over-collection still continues due to various socio-economic factors. Pakistan has established reserve areas, mainly national parks, covering 10% of the total land area. However, as management and resources available in these areas are very limited, over-exploitation of medicinal plants continues. Recent funds granted to the Government by the Global Environment Facility (GEF) are enabling IUCN-Pakistan and Forest Research Institute to jointly develop management plans for a very limited number of areas while much areas still remains to be considered.

Ex-situ conservation of the medicinal plant resource base does not exist, and in-situ conservation has not yet been effective. In few cases involving hill forests in northern areas, agreements underway between the provincial forests departments and community groups, to declare these areas as protected areas whereby no extraction of medicinal plants is to be permitted for a period of six years. This may facilitate the regeneration of medicinal plant resources to some extent. However, resources tenure rights have to be clarified and the management of resources by local communities and NGO should be fully incorporated into the management plan, and strategies developed for medicinal plant harvesting.

Major Conservation Projects

Most of the conservation projects under operation are focused on environment rehabilitation and forest conservation. As medicinal plant resource base in the key component in environment and forest conservation, some important key projects and programs that could address the
medicinal plant sector as well, area are described below:

1. Environmental Rehabilitation in NWFP and Punjab:

This project covers the upland areas of Pakistan, comprising Murree-Kahuta, Gilgit, Dir and Kohistan. The Government of Pakistan is supporting this project and Commission of European Communities in coordination with IUCN has launched this project for the period 1996-2003. The main objective of the project is to bring a halt to and effect and reversal of the on-going processes of environmental degradation through integrated measures of natural resource rehabilitation, sustainable socio-economic development and the sustainable use of natural resources.

2. Maintaining Biodiversity in Pakistan with Rural Communities:

The aim of this project is to demonstrate the conservation of biodiversity by providing technical skills to rural communities to manage natural resources for sustainable use and derive income from trophy hunting, eco-tourism use and the marketing of medicinal herbs and spices. It operates in Chirtal, Swat and Dir through Wildlife Department, NWFP with the financial assistance of Global Environment Facility (GEF).

3. Palas Area Conservation Project:

Due to remoteness and its inaccessibility, the natural habitat of Palas valley is healthy and rich in biodiversity. With the help of local communities, efforts are being made to keep this habitat free from commercial harvesting, and to identify and promote alternate sources of income from it.

4. Kalam Integrated Development Project:

This is a Swiss-funded multi-sectoral project, dealing with agriculture, forestry and village development in an integrated way. The community has been organized into village and women organizations. The project has been effective in biodiversity management through growing off-season vegetables.

5. Siren Valley Forestry Development Project:

It is under implementation in the Siren valley of Manshera district. The project funded by Germany and NWFP Government, aims at sustainable forest management by adapting a joint forest management approach.

Acknowledgement: The author is grateful to Medicinal and Aromatic Plants Program in Asia (MAPPA), International Development Research Centre (IDRC) for the invitation to attend the Regional Workshop.

References


Conservation and Cultivation of Medicinal Plant Genetic Resources in Pakistan

Shakeel Haider Zaidi

ABSTRACT

Pakistan is bestowed with rich natural resources, diverse ecological conditions with ethnic diversity and ancient civilization. It has rich flora of over 6000 species of flowering plants reported to occur in different provinces including Kashmir. A very large number is found in northern and north-western parts of the country. Our of these, 1000 plant species have been documented for phytochemical properties, whereas 350-400 species are trade in different drug markets and are used by 27 leading manufacturing units of Gerco-Arabic, Ayurvedic and Homeopathic medicines. Further more, about 50000-60000 tabibs (practitioner of Greco-Arabic medicine) and a number of un-registered practitioners scattered in rural and remote hilly areas utilize more than 200 drug plants in traditional and folk medicines as household remedies against several diseases in primary health care system.

Besides, it can be a source of sustained to the people of hilly and plain areas, traders and pharmaceutical concerns. The current treads in increasing demand for medicinal and aromatic plants from alpine and sub-alpine regions of Hindu-Kush Himalayas, and several products from diverse species within and outside the country the country resulted in the depletion of this vital forest resource. Therefore, this is a time to formulate the strategy for rational utilization including training in authentic identification, scientific surveys, collection, grading, processing, chemical characterization, marking and in-situ cultivation of those endangered/rare medicinal plant species that need conservation for sustainable uses.

Introduction

Medicinal plants are a valuable natural resource and regarded as future of safe drugs. Sustainable management of this renewable natural resource is a debatable issue of global and national importance. It not only provides basic raw material for the preparation of a number of allopathic medicines, but also more than 70% of total population residing in the plain and remote hilly areas rely on plant-lore and traditional system of medicines for primary health care.
The total value of medicine consumed in the country is worth rupees 35 billions per annum. Out of this, medicines worth Rs.28 billions are manufactured, whereas drug worth than 7 billions rupees are imported. This is due to non-development of indigenous pharmaceutical industries over the years according to resource availability. As a result, a number of national and multinational pharmaceutical firms import raw and packing material worth rupees 18 billions. Thus sustainable development and utilization of medicinal plant resource is of prime importance to meet growing demands of pharmaceutical industries and to earn foreign exchange from the export of dried herbal drugs and their derivatives.

Pakistan occupies a unique position among developing countries. It has a veritable emporium of non-wood forest products due to its varied climate and ecosystems, which reflect bio-diversity and valuable plant heritage. In the recent years, there has been consistent growth in demand of many plant-based drugs and several plant products from diverse species. This has given rise to large-scale collection, which resulted in the scarcity of a number of valuable medicinal plant species e.g. Saussurea costus, Dioscorea deltoidea, Gloriosa superba, Picrorhiza kurrooa, etc. and their wide range of chemical diversity is diminishing due to habitat degradation. Most of the species are of global importance and placed in CITES listing due to over-exploitation in the past. Therefore, concerted efforts should be paid for conservation of endemic species of pharmacopoeial importance, which could be otherwise useful for genetic manipulation to restore the plant wealth and to improve the yield of food, fodder and fiber corps. Moreover, many plants have good potential to develop into life saving and essential medicines.

The existing medicinal plant resource can broadly be classified into two categories namely (1) Naturally occurring drug plants and (2) Cultivated plants. Plants under first category can be further divided on the basis of their production as (a) Naturally occurring drug plant (b) Plant growing as weed remnants in cultivated field.

**Naturally occurring drug plants**

Medicinal plants growing naturally in high-hill forests require a long period of growth ranging from 3 – 8 years to reach maturity for commercial exploitation. Whereas those occurring in the plains appeared annually as spring flora with the exception of few which are perennial in nature. In order to tap this natural resource, qualitative surveys were conducted throughout the country (Anon. 1956) and listed 350 plant species of recognized medicinal value used in Greco-Arabic, Ayurvedic system of medicines and many of them are also included in pharmacopoeias. Notable plants among these occurring in different regions of the country are listed below:
Balochistan

Ephedra gerardiana (Asmania), Juniperus excelsa (Abhel), Withania coagulans (Panir-dodi), Thymus linearis (Banajwain), Prunus amygdalus (Badamtalkh), Berberis lycium (Darhald), Perovskia abrotanoides (San-shob) and Zuffa officinalis (Zupha).

Sindh

Cassia angustifolia (Sanna), Ricinus communis (Castor), Commiphora mukul (Gugal), Citrulus colocynthis (Hantal), Cassia fistula (Amaltas) and Rhazya stricta (Vena).

Punjab

Fumaria indica (Shahtara), Cassia absus (Chaksu), Justicia adhatoda (Berg-bansa), Datura alba (Dhatura), Plantago ovata (Ispaghhol), Ricinus communis (Castor), Abutilon indicum (Pili-buti), Solanum nigrum (Mako) and Peganum hermala (Hermal).

NWFP

Artemisia maritima (Afsantine), Hyoscyamus niger (Ajwain khurasani), Dioscorea deltoidea (Kanis), Valeriana jatamansii (Mushk-bala), Aconitum heterophyllum (Atees-talkh), Datura stramonium (Datura), Colchicum luteum (Suranjantalkh), Ferula foetida (Hing), Rheum australe (Revand-chini), Podophyllum hexandrum (Bankakari), Viola serpens (Banafsha), Gentiana kurroo (Nilkant), Lavatra kashmiriana (Resha-khatmi) and Swertia chirayita (Chirata).

Keeping in view the economic important certain pharmacopoeial plants, Medicinal Plant Branch of PFI has carried out pioneer work (1970-86) on quantitative surveys of medicinal plants in their natural habitats in different forests of NWFP, Punjab, part of Balochistan and Northern Areas. This work provided basic useful information regarding local availability of medicinal plants in qualitative and quantitative term, which was hitherto non-existent. It also facilitated and helped many industrial units in the country, e.g. Sandoz, Marker Alkaloids, Kurram Chemical Company etc., who utilize the indigenous medicinal plant resources as raw material in the manufacture of various medicinal products. It is worth to mention that survey results of eighties have become redundant with the passage of time and at present these information cannot be used:

- to assess their available potential in natural habitats,
- to identify the locality of abundant availability, and
- to identify endangered species.
This survey is essential to formulate judicious plan of rotational exploitation and regeneration, so that no economic and medicinal importance becomes endangered in future.

**Survey of medicinal plants in Chitral: A case study**

In this context a rapid appraisal survey of medicinal plants was carried out on 12000 hectares in five valleys of Chitral (Booni-Gol, Chunarkan, Shishi, Begusht and Bomburet) during 1995-97 to determine potential status of drug plants and their marketing problems. Information regarding availability and sustained yield of medicinal plants in different valleys is given Table 1.

Survey results indicated that a number of drug plant species are available in abundance in 5 sampled valleys of Chitral and these plants are also found in other adjacent valleys such as Laspur, Yarkhun, Zaeet, Reshun, Arkari, etc. This natural resource is not utilized in spite of plentiful occurrence of valuable drug plants. This is due to lack of information about availability, transportation facilities and higher collection cost made it uneconomical. This area has good potential for sustainable exploitation and can serve as a source of sustained supply of a number of un-exploited drug and aromatic plants of industrial importance, which can be used for the extraction of active ingredients and value-added products. These plants are listed in the Table 2.

Besides, some indigenous drug plant like *Glycyrrhiza glabra, Ferula foetida,*

<table>
<thead>
<tr>
<th>S. #.</th>
<th>Species</th>
<th>Part used (ha)</th>
<th>Surveyed area (tonnes)</th>
<th>Yield of crude drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><em>Artemisia maritima</em></td>
<td>Flowering twigs</td>
<td>12,000</td>
<td>90.5</td>
</tr>
<tr>
<td>2.</td>
<td><em>Ephedra gerardiana</em></td>
<td>Twigs</td>
<td>12,000</td>
<td>87.1</td>
</tr>
<tr>
<td>3.</td>
<td><em>Capparis spinosa</em></td>
<td>Fruits</td>
<td>7,200</td>
<td>56.6</td>
</tr>
<tr>
<td>4.</td>
<td><em>Berberis lycium</em></td>
<td>Roots</td>
<td>9,600</td>
<td>64.9</td>
</tr>
<tr>
<td>5.</td>
<td><em>Verbascum thapsus</em></td>
<td>Leaves</td>
<td>9,600</td>
<td>10.0</td>
</tr>
<tr>
<td>6.</td>
<td><em>Glycyrrhiza glabra</em></td>
<td>Roots</td>
<td>5,900</td>
<td>35.1</td>
</tr>
<tr>
<td>7.</td>
<td><em>Ferula foetida</em></td>
<td>Root gum</td>
<td>7,200</td>
<td>27.2</td>
</tr>
<tr>
<td>8.</td>
<td><em>Bergenia ciliata</em></td>
<td>Roots</td>
<td>9,600</td>
<td>22.6</td>
</tr>
<tr>
<td>10.</td>
<td><em>Mentha longifolia</em></td>
<td>Leaves</td>
<td>12,000</td>
<td>12.2</td>
</tr>
<tr>
<td>11.</td>
<td><em>Hippophae rhamnoides</em></td>
<td>Fruits</td>
<td>12,000</td>
<td>14.6</td>
</tr>
</tbody>
</table>

*Source: IUCN quarterly progress reports on medicinal plant survey*
Table 2. Un-exploited drug plants available in considerable quantities

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Plant species</th>
<th>Part used</th>
<th>Active ingredient</th>
<th>Medicinal Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Artemisia maritima</td>
<td>Flowering top</td>
<td>Santonin</td>
<td>Ascaricide and anthelmintic</td>
</tr>
<tr>
<td>2.</td>
<td>Bergenia ciliata</td>
<td>Root and rhizome</td>
<td>B-sitosterol and Bogeni</td>
<td>Tonic in diarrhoea &amp; pulmonary infection</td>
</tr>
<tr>
<td>3.</td>
<td>Berberis lycium</td>
<td>Root</td>
<td>Berberine</td>
<td>Amebicidal</td>
</tr>
<tr>
<td>4.</td>
<td>Cannabis sativa</td>
<td>Leaf and seed</td>
<td>Cannabinol, Cannabinin and seed oil</td>
<td>Antibacterial, analgesic &amp; sedative</td>
</tr>
<tr>
<td>5.</td>
<td>Capparis spinosa</td>
<td>Flower bud</td>
<td>Rutin</td>
<td>Decreases capillary fragility &amp; antihaemorrhagic</td>
</tr>
<tr>
<td>6.</td>
<td>Ephedra gerardiana</td>
<td>Twig</td>
<td>Ephedrine and pseudoephedrine</td>
<td>Anti-asthmatic and bronchodilator</td>
</tr>
<tr>
<td>7.</td>
<td>Ferula foetida</td>
<td>Root-gum</td>
<td>Essential oil and ferulic acid</td>
<td>Carminative and intestinal antiseptic</td>
</tr>
<tr>
<td>8.</td>
<td>Glycyrrhiza glabra</td>
<td>Root</td>
<td>Glycyrrhizin</td>
<td>Anti-inflammatory and anti-allergic</td>
</tr>
<tr>
<td>9.</td>
<td>Heracleum candicans</td>
<td>Root</td>
<td>Xanthotoxin</td>
<td>Radio-protective and vasodilator</td>
</tr>
<tr>
<td>10.</td>
<td>Hippophae rhamnoides</td>
<td>Fruit</td>
<td>Vitamin C, carotene and oil</td>
<td>Cooling and refrigerant</td>
</tr>
<tr>
<td>11.</td>
<td>Mentha arvensis</td>
<td>Leaf</td>
<td>Essential oil rich in carvone and menthol</td>
<td>Carminative, diuretic and refrigerant</td>
</tr>
<tr>
<td>12.</td>
<td>Prongos pabularia</td>
<td>Root</td>
<td>Osthol and aviprin</td>
<td>Respiratory and circulatory stimulant</td>
</tr>
<tr>
<td>13.</td>
<td>Rheum australe</td>
<td>Root, rhizome and petiole</td>
<td>Emodin and rhein</td>
<td>Purgative, astringent and used to cure diarrhoea</td>
</tr>
<tr>
<td>14.</td>
<td>Verbascum thapsus</td>
<td>Whole plant</td>
<td>Glycoside and saponin</td>
<td>Root extracts useful in diarrhoea and bronchial asthma</td>
</tr>
</tbody>
</table>

Bunium persicum, Berberis lycium, Scutelaria prostrata, etc. through occurred naturally are smuggled into the country by professional carries through Afghanistan and are sold at cheaper rates in different drug markets.

Plants Growing as Weeds

These plants are found as weed remnants in cultivated field. Some of important weeds are Fumaria indica (Shatra), Carthamus oxycantha (Poli), Chenopodium
Conservation and Cultivation of Medicinal Plant Genetic Resources in Pakistan

album (Bathu), Asphodelus tenuifolius (Piazi), Silybum marianum, Celome viscosa (Hulhul), Convolvulus arvensis (Lehli) and Solanum nigrum (Mako) are plants which can be collected and sold at a lucrative price in the market.

Cultivation of medicinal and aromatic plants

Packages of agro-technology:

There are a large number of wild plants used as drug but a few are cultivated on the basis of their economic importance and medicinal uses. Cultivation trials carried out at PFI indicated that a number of economic and drug plants could be cultivated as minor cash crops to meet the increasing demand of local drug markets. These plants could also be utilized for the extraction of alkaloids used in different pharmaceutical preparation. As a result of continuous dissemination of packages of cultivation practices through popular bulletins and extension service, a number of economic, medicinal and aromatic plants are cultivated on pilot-scale in various parts of the country to meet the requirement of drug markets.

Some of medicinal plants are of great importance and required in sizable quantities, while other required in small quantities and obtainable from forests and their cultivation is not economical. Therefore, herbs, which are in great demand and fetch handsome price, can be taken up for pilot-scale cultivation. These plants do not require cultivated land and can be easily grown on marginal land as well as in backyard can supplement cash income to the farmer.

Management of medicinal and aromatic plants

Mountainous regions provide a naturally conductive habitat along with ideal climate conditions suited for the growth of medicinal flora. For sustainable development of this renewable natural resource more emphasis has been given to active ingredients as compare to the yield of the plants. Medicinal plants of high altitudes have limited scope for their sustenance in wild. There is an urgent need to save these plants for their multiplication by growing them on mass scale in protected areas of forest enclosures. Therefore, in-situ conservation of profitable endangered medicinal plant species needs to be carried out for sustainable reuses in medicine.

The existing medicinal plant resource can be classified into two broad categories for the purpose of cultivation and propagation i.e., plants requiring a long period of growth (3-8 years) to reach maturity at higher elevation (Group A), and plants which can be cultivated as short duration crops in the foothill and plains (Group B). These are listed in Table 4.

High altitude rare medicinal plants mentioned in Group A cannot be cultivated on commercial scale due to their long life cycle. These plants are to be conserved in their natural habitats to meet
Table 3. Cultivation of medicinal plants with locality, area under cultivation and annual production

<table>
<thead>
<tr>
<th>Name of plant</th>
<th>Provinces where cultivated</th>
<th>Annual Production (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cichorium intybus (Tukham-kasni)</td>
<td>Punjab (Silkot, Deska nad Gujranwala)</td>
<td>12</td>
</tr>
<tr>
<td>Cuminum cyminum (Zeera-safaid)</td>
<td>Baluchistan (Peshin, Kalat, Chagi and Quetta)</td>
<td>3219</td>
</tr>
<tr>
<td>Curcuma domestica (Turmeric)</td>
<td>Punjab (Gujrat, Kasur, Sahiwal)</td>
<td>23484</td>
</tr>
<tr>
<td>Foeniculum vulgare (sonf)</td>
<td>Sindh (Dadu and Sehavin Sharif)</td>
<td>BWFP (Peshawar, D.I.Khan)</td>
</tr>
<tr>
<td>Lawsonia alba (Henna)</td>
<td>Punjab (Bhawalpur &amp; Sarghoda)</td>
<td>1463</td>
</tr>
<tr>
<td>Malva sylvestris (Tukham-khubazi)</td>
<td>Punjab (Sialkot and Gujranwala)</td>
<td>10</td>
</tr>
<tr>
<td>Ocimum basilicum (Niazboo)</td>
<td>Sindh (Mirpur Khas and Hyderabad)</td>
<td>2000</td>
</tr>
<tr>
<td>Plantago ovata (Ispaghol)</td>
<td>Punjab (Haroonabad, Chistian, Yazman Bhawalpur)</td>
<td>800</td>
</tr>
<tr>
<td>Pongamia glabra (Tukham-karanjwa)</td>
<td>Punjab (Bhawalpur, Multan and Bhawalnagar)</td>
<td>15</td>
</tr>
<tr>
<td>Ricinus communis (Castor seeds)</td>
<td>Sindh (Tharparker and Larkans)</td>
<td>17500</td>
</tr>
<tr>
<td>Rosa damascena (Gul-surkh)</td>
<td>Punjab (Chakwal, Kalar-Kahar)</td>
<td>150</td>
</tr>
<tr>
<td>Sesamum indicum (Til)</td>
<td>Sindh (Hyderabad, Mirpur Khas and Sukkur)</td>
<td>Punjab (Gujrat, Kasur, Silkot, Gujranwala and Muzaffargarh)</td>
</tr>
<tr>
<td></td>
<td>Sindh (Tharparker, Dadu)</td>
<td>1600</td>
</tr>
<tr>
<td>Name of plant</td>
<td>Provinces where cultivated</td>
<td>Annual Production (tonnes)</td>
</tr>
<tr>
<td>---------------</td>
<td>----------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Trigonella foenum-graecum (Methi)</td>
<td>Sindh and Punjab (Kasur area)</td>
<td>1326</td>
</tr>
<tr>
<td>Cyamopsis tetragonoloba (Guara)</td>
<td>Punjab (Multan, Bhawalpur, Sarghoda)</td>
<td>3000</td>
</tr>
<tr>
<td></td>
<td>Sindh (Hyderabad and Larkana)</td>
<td></td>
</tr>
</tbody>
</table>

Table 4. Management of medicinal and aromatic plants according to their period of growth and elevation.

**Group-A**

**Long duration plants of higher elevation**

- Dioscorea deltoidea (Kanis)
- Podophyllum hexandrum (Bankakri)
- Aconitum heterophyllum (Aits)
- Valeriana jatamansii (Mushkbala)
- Berberis lycium (Darhald)
- Saussurea costus (Kuth)
- Polygonatum multiflorum (Shakukal-misri)
- Dactylorhiza hatagirea (Salep panja)
- Jurinea macrocephala (Gufual-dhoop)
- Asparagus recemosus (Muslisafed)
- Paeonia emodi (Mamekh)
- Bergenia ciliata (Zakham-e Hayat)
- Atropa acuminate (Angoor-shafa)
- Digitalis purpurea (Berg talkh)
- Colchicum luteum (Suranjat talkh)
- Gentiana kurroo (Nilkhanth)
- Acorus calamus (Bach)
- Picrorhiza kurrooa (Kor)
- Rheum australe (Revand chini)
- Onosma bracteatum (Gao-zaban)
- Ferula foetida (Hing)
- Heracleum candicans (Tamur)

**Group-B**

**Short duration plants of lower elevation and plains**

- Plantago ovata (Ispghol)
- Carum copticum (Ajwain)
- Nigella sativa (Kalonji)
- Foeniculum vulgare (Sonf)
- Posraria corylifolia (Babchi)
- Chicorium intybus (Kasni)
- Ricinus communis (Castor)
- Lalemaentia royleana (Iukmi-balangah)
- Cyamopsis tetragonoloba (Guar)
- Ocimum basilicum (Niazboo)
- Mentha arvensis (Mint)
- Cymbopogon citratus (Lemongrass)
- Cymbopogon martini (Rosha grass)
- Datura metel (Datura)
- Fagopyrum esculentum (Buckwheat)
- Pimpinella anisum (Anisoon)
- Bunium persicum (Kala zeera)
- Linum usitatissimum (Alsi)
- Matricaria chmomilla (Gul-babooana)
- Hyoscyamus niger (Khurasani-ajwan)
- Apium graveolens (Ajmod)
- Viola serpens (Banafshah)
needs of local people and to provide a resource for exploration of new pain killing and life saving drugs. However, short duration plants mentioned in Group B can be cultivated on foot-hills and plain and can give better economic return than the traditional crop of the area (Khan and Zaidi 1994).

Conservation of Medicinal and Aromatic Plants

Some preliminary work on in-situ conservation and regeneration of medicinal plants in the high-hill forests of NWFP and establishment of living plant museum for ex-situ conservation carried out by Medicinal Plants Branch, Pakistan Forest Institute, Peshawar in the past under PL-480 project “Artificial regeneration of some important indigenous and exotic medicinal plants in the hill forests of NWFP”. In this context, studies were conducted to develop techniques of regeneration, modes of propagation, cultural and agronomic requirements and perpetuation of higher elevation medicinal plant species in the forest enclosures of hilly areas of Kuza Gali and Thandiani (2800m). The studies resulted in the determination of optimum period of growth of Dioscorea deltoidea (Kanis). Another regeneration and agronomic studies carried out on Atropa acuminata plants, well known for their atropine contents, resulted in the standardized technique of raising nursery seedlings and regenerating the plants in their natural habitat. Appropriate doses of NPK fertilizer and suitable spacing for getting higher yield of leaves and root were determined.

Rheum australe and Saussurea costus seedlings were successfully raised and transplanting techniques for both the species were standardized. Introduction and adaptability studies conducted on Rheum australle indicated that plant required at least five years for development of marketable sized roots, ridge planting in combination with two regular hoeing would give better root yield than planting on flat beds and no soil working. Similar experiments conducted on determination of optimum growth periods and suitable spacing indicated that Saussurea costus, Podophyllum hexandrum and Valeriana jatamansii plants being perennial showed profuse vegetative growth and gave higher yield of root during 5th year’s growth as compared to root yield recorded in the 3rd and 4th year’s growth under a spacing of 45x30 cm. Introduction, cultural and fertilizer trials conducted on Digitalis purpurea and D. lanata resulted in the standardization of techniques of regeneration and successful cultivation of these two exotic species at Galiat forest enclosure.

Trade of Medicinal Plants

Medicinal plants are increasingly used by the pharmaceutical industries, dawakhanas, and as household remedies. The number of manpower engaged in the collection, distribution and trade is quite sizable. Approximately 350-400 items of
crude drugs are sold in the local markets depending upon their demand and supply position.

Marketing of medicinal plants present a scenario of diverse problems encountered at various stages. It consists of a multitude of herb collectors and growers to the rural herb dealers, whole-sellers and processors, exporters and importers and a large number of retailers spread throughout the country. Approximately 5000-6000 poor families residing in the remote hilly areas are engaged in the collection during summer months. The annual consumption of various herbal drugs can be divided into four categories as below:

Category-A

Crude drugs sold more than 200 tonnes per annum

Glycyrrhiza glabra (Mulathi), Carum copticum (Ajwain), Valeriana jatamansii (Mushk Bala), Cassia fistula (Amaltas), Punica granatum (Anardana), Foeniculum vulgare (Sonf), Coriandrum sativum (Dhania), Cuminum cymimum (Zeera safaid), Rosa damascena (Gul-e-surkh), Plantago ovata (Ispaghhol), Onosma bracteatum (Gaozaban), Zizyphus vulgaris (Unab), Lawsonia alba (Hina), Bunium persicum (Kala Zeera) and Mentha longifolia (Paudina kohi).

Category-B

Crude drugs sold between 100-200 tonnes per annum

Viola serpens (Banafsha), Adiantum capillus-veneria (Persoshan), Terminalia bellirica (Bhera), T. chebula (Hareer), Centurea behen (Bahman sufaid), Myrtus communis (Hub-ul-Aas), Ferula foetida (Heeng), Polygonum amplexicaule (Anjabar), Rheum australe (Revand chini), Phyllanthus emblica (Amla), Withania coagulans (Panir dodi).

Category-C

Crude drugs sold between 51-100 tonnes per annum

Artemisia maritima (Afsantine), Cassia angustifolia (Sana), Cordia latifolia (Sapistan), Zingiber zerumbet (Narkachoor), Peganum harmala (Hermal), Malva sylvestris (Tukhame khubazi), Nigella sativa (Kalongji), Commiphora mukul (Gugal), Sisymbrium irio (Khaksir), Cichorium intybus (Kasni), Salvia haemotodes (Bahman-surkh), Mallotus philippensis (Kamila), Lallemantia royleana (Yukhame-e-balanga) and Saussurea costus (Kuth).

Category-D

Crude drugs sold between 2-50 tonnes per annum

Fumaria indica (Shatra), Swertia chirayita (Chirata), Berberis lycium (Darhald), Nymphaea lotus (Nelofar), Althaea officinalis (Tukham-e-khatmi), Hyoscyamus niger (Khurasni ajwain), Zanthoxylum armatum (Timbar), Aloe indica (Kauwar gandal), Cassia absus (Chasku), Acorus calamus (Bach), Nepeta ruderalis (Badar tonia) and Colchicum luteum (Suranjan-e-talkh).
Trade in medicinal plants is erratic due to standard imposed by the Developed Countries. The prices also fluctuate greatly due to variation in rates even in the same market and it is difficult to ascertain actual rate of a particular drug plant.

**Export**

Medicinal Plants exported in crude forms are generally listed in the “Foreign Trade Statistic of Pakistan”. The average data for the last 5 years are given below:

Crude drugs valued at 21.8 million rupees are exported annually from Pakistan. Like agricultural commodities the exports of medicinal plants do not find sufficiently remunerative price at the international level due to the fluctuation in price and supply position of crude drug in the market.

**Conclusion and recommendations**

1. Facilities for free exchange of germplasm material of medicinal and aromatic plants may be provided from the south Asian countries.

2. Information on the marketing and scope of medicinal plants in the international market may be compiled and freely exchanged.

**Table 5. Crude drugs exported from Pakistan**

<table>
<thead>
<tr>
<th>Name of plant</th>
<th>Part used (tones)</th>
<th>Quantity Rs. million</th>
<th>Value in £</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Ricinus communis</em> (Castor)</td>
<td>Seeds</td>
<td>1220</td>
<td>6.93</td>
</tr>
<tr>
<td><em>Cyamopsis tetragonoloba</em> (Guara)</td>
<td>Seed-gun</td>
<td>394</td>
<td>9.86</td>
</tr>
<tr>
<td><em>Atropa acuminata</em> (Belladonna)</td>
<td>Leaves &amp; Roots</td>
<td>34</td>
<td>0.70</td>
</tr>
<tr>
<td><em>Datura metel</em> (Dahtoora)</td>
<td>Leaves</td>
<td>4</td>
<td>0.10</td>
</tr>
<tr>
<td><em>Plantago ovata</em> (Ispaghhol)</td>
<td>Seeds</td>
<td>32</td>
<td>0.43</td>
</tr>
<tr>
<td><em>Lowsonia alba</em> (Henna)</td>
<td>Leaves Power</td>
<td>5.11</td>
<td>0.11</td>
</tr>
<tr>
<td><em>Terminalia chebula</em> (Harar)</td>
<td>Fruit</td>
<td>51.00</td>
<td>0.14</td>
</tr>
<tr>
<td><em>Chichorium intybus</em> (Tukham-kasni)</td>
<td>Whole plant</td>
<td>1.40</td>
<td>0.20</td>
</tr>
<tr>
<td><em>Cassia angustifolia</em> (Sana)</td>
<td>Leaves and Pods</td>
<td>0.20</td>
<td>0.03</td>
</tr>
<tr>
<td><em>Ferula foetida</em> (Asafoetida)</td>
<td>Gum</td>
<td>47.00</td>
<td>2.41</td>
</tr>
<tr>
<td><em>Acacia nilotica</em> (Kikar)</td>
<td>Gun-arabic</td>
<td>10.12</td>
<td>0.06</td>
</tr>
<tr>
<td><em>Glycyrrhiza glabra</em> (Liquorice)</td>
<td>Roots</td>
<td>52.02</td>
<td>0.32</td>
</tr>
<tr>
<td><em>Unani and Ayurvedic medicines</em></td>
<td></td>
<td>3.00</td>
<td>0.53</td>
</tr>
<tr>
<td>Total:</td>
<td></td>
<td>1853.85</td>
<td>21.82</td>
</tr>
</tbody>
</table>
3. Training facilities to cope with the post-harvesting problems of medicinal plants may be provided to enable the developing countries like Pakistan to improve the qualities of crude drug being exported or consumed within the country.

4. Exchange of information on the fabrication of extraction plants developed by different South Asian countries.

5. Facilities for testing the quality of active ingredients of crude drug meant for export or consumption within the country may be provided to avoid adulteration.

6. Exchange of information on the large scale organized cultivation of medicinal and aromatic plants as practiced in some South Asian countries.

7. Establishment of nurseries of higher elevation medicinal plants for supply of seed and planting stock followed by pilot-scale cultivation of profitable drug species in the farmer’s field for popularization. Thus in-situ cultivation would result in mass production and sustenance in their natural abode for future prosperity of inhabitants.

8. Research facilities for development of medicinal and aromatic plants are improved at the Institute through development projects. Such a development programme would be helpful in enhancing the existing knowledge of natural and cultivation medicinal plants and for dissemination of information amongst all government organizations, “Dawakhanas” and persons engaged in this vital industry.

Acknowledgement: The author is grateful to IDRC/MAPPA for the invitation to attend the Regional Workshop, Pokhara, Nepal.

References


Local Management of Medicinal and Aromatic Plants in Gorkha District, Nepal

Helle O. Larsen

ABSTRACT

The potential of local institutions in management of common property natural resources is widely acknowledged, not least in Nepal which has one of the world's most progressive forest policies in terms of forest user group participation. But high-altitude medicinal and aromatic plants are rarely included in forest management plans, meaning that formal management responsibilities lie with central authorities. This paper explores the practices and potentials for management of commercially collected high-altitude medicinal and aromatic plants in Gorkha District, Nepal. Through 80 semi-structured interviews in seven village development committees having access to a spatially connected alpine area, current practices are outlined and future potentials are discussed. It is concluded that most often the current collection is regulated in very informal ways, but that these (with central assistance) are more likely to be successful than a purely central approach.

Introduction

For many inhabitants of rural communities in Nepal, collection and trade of wild medicinal and aromatic plants (MAPs) is one of little income generating activities. Although the state-led community forestry programme in Nepal demonstrates a national understanding of the importance of collective action in local management of forests for firewood, fodder and timber (Arnold and Campbell 1985), this has not been extended to include commercially collected non-timber forest products (NTFPs), such as MAPs (Edwards 1996). Common property management of natural resources is widespread in the Nepalese Middle Hills (Jackson 1999; Rai and Thapa 1993; Tamang 1993). Yet MAPs are assumed to be an open-access resource for which central control is paramount for sustainable exploitation (Chaudhary 1998; HMG 1988; Kandel 1998; Malla et al. 1995;)

1 The official Nepalese definition is: all products from forests and related land uses except timber, fuelwood and fodder (HMG, 1988)
Local Management of Medicinal and Aromatic Plants in Gorkha District, Nepal

Shresta and Joshi 1996). This attitude is notable in light of the widespread illegal collection and trade (Aryal 1993) and the limited data available on which to base sustainable management (Kleinn et al. 1996); there is e.g. no national estimate of the Nepalese MAP resource.

The objective of this research is to assess to what extent MAPs in Nepal can be termed a common property resource (CPR), and what implications this has for designing policies conducive to management that is both ecologically sustainable and socially just.

Methodology

The research is investigating local management systems of MAP resources in the central part of Gorkha District, Nepal. In this area the population from seven VDCs2 (Barpak, Gyachowk, Kharibot, Laprak, Singla, Sirdibas, Uhiya) has access to one large, spatially connected high-altitude area for grazing and collection of MAPs. Information was gathered during the periods of February to October 2000, and January to November 2001. Interviews in one village served to form an initial understanding of local collective action mechanisms, and a checklist for further interviews was developed. Subsequently, eighty semi-structured interviews of 30 to 90 minutes duration and many informal conversations were undertaken with inhabitants from the seven VDCs, traders of MAPs and district forest office staff. Additional information was collected through rapid rural appraisal (RRA) exercises, attending village meetings, observing collection of high altitude MAPs, and by observations while crossing the central alpine collection area from east to west.

Through review of Nepalese policies and analysis of the information obtained from interviews, endogenous and exogenous factors influencing how MAP collection is organised and carried out are identified. Following major theories in collective action (Oakerson 1992; Ostrom 1990) analytical emphasis is placed locally on resource attributes, socio-economic characteristics of the collectors, impact of outside influence and resource users’ interactions related to rule making.

Results

A conceptual framework of MAP collection in the study area was developed to explain what influences the local organization of high altitude MAP collection, and how. The framework is shown in Figure 1; presentation of research findings follows the category titles in the figure.

Community characteristics

The dominant ethnic group in the central area of Gorkha District is gurung, in the eastern part with inclusion of some tamang, and in many villages there are

2 An administrational unit comprising about 5,000-9,000 inhabitants.
Sharing Local and National Experience in Conservation of Medical and Aromatic Plants in South Asia

Figure 1. Conceptual framework of how high altitude MAP collection is organised.

Communities with access to the central MAP collection area are similar with respect to norms for co-operation, heterogeneity (economic stratification) and types of conflicts (discrimination of low caste village members). Differences were found in terms of (i) wealth, as some communities were able to cultivate paddy rice and were located closer to economic centres; (ii) size, as settlement in some VDCs was concentrated in one large village whereas other VDCs had several smaller villages and (iii) ethnic composition, as tamang are not found in the eastern part of the district.

Reciprocity

Norms for co-operation in villages of the study area are strong, and presently both small groups of kami (smiths, scheduled caste). The kami do not possess land, their traditional occupation is forge work but current demands are not sufficient to employ all, and wage labour and sharecropping are frequent undertakings. The gurung are mainly farmers, they cultivate maize, millet and wheat (cultivation of paddy rice is not possible in the northern part of the central area), and rear cattle, buffaloes, sheep and goats. Many supplement the income with wage labour, portage and collection of MAPs, some engage in local trade and some receive pension from the Indian or British army. Access to any of the villages is by foot; the closest market towns are Gorkha and Arughat, of which the latter is accessible by road only in the dry season.
spontaneous and induced local organizations exist. In all villages visited, decisions regarding pasture and forest management, as well as hydropower, water tap maintenance and law and order are made by the community members at public meetings or by locally elected committees. The number of decision-makers can vary according to the nature of decisions, generally all individuals involved in an issue have the right to become involved, but some respected individuals tend to be involved in most decision-making in a village.

Since traditions for co-operation in management of common pool resources within the villages are strong, individuals can rationally expect norms of reciprocity, also when new activities or resources are involved.

**Legislation**

Current legislation prescribes the need for collection permits and royalty payment (HMG, 1995). MAP collectors are somewhat aware of this, but since traders deal with this paperwork, not much thought is given to the issue. Until February 2001 the collection of two plants, Dactylorhiza hatagirea (pancha unle) and Cordyceps sinensis (yarsagumba), was banned. The ban on yarsagumba was lifted; they had not heard about the ban on kutki by autumn 2001.

The bans on collection have had some effect on the organization of MAP collection. These days collection of panchaunle, which has a high market value, continues in a less visible fashion than before, and collected amounts may have decreased. Local leaders officially try to stop the collection, but unofficially they express doubt as to the background of the ban. After February 2001 yarsagumba is collected in areas where it was previously not known to occur, and it seems that lifting the ban has drawn collectors' attention to the product.

**Resource attributes**

Commercially collected high-altitude MAPs are typically found on alpine meadows at around 3500 to 4500m. Collection areas coincide with community pastures, often located 1-2 days from villages. The commercial collection of MAPs has been undertaken in the study area for more than three generations, and it focuses on four species collected July to November (Nardostachys grandiflora, Neopicrorhiza scrophulariifolia, Aconitum orochryseum, Dactylorhiza hatagirea); the collection of a fifth species, Cordyceps sinensis, is becoming increasingly popular. The products are sold to village traders, road head traders in Arughat, Gorkha bazaar, or on rare occasions in Kathmandu.

High-altitude MAPs in the central area of Gorkha District constitute a common
Sharing Local and National Experience in Conservation of Medical and Aromatic Plants in South Asia

property resource in as much as there is a defined group (the population of a VDC, or in some cases a sub-group of a VDC) holding access and exclusion rights to areas with boundaries that are clearly defined by ridges and rivers, and recognised by all inhabitants of the area. The origins of the boundaries are unclear, but they have existed for more than three generations and are probably related to pasture management; the existence of Nepalese mountain pasture management systems is well-documented (Jackson 1999; Rai and Thapa 1993). Monitoring of the MAP resource is not formally institutionalized but local shepherds and MAP collectors are present in the alpine area until mid to late October, and they observe and take action against intruders when possible.

Collection of MAPs involves removal of the root of the plants, and using the terminology of Oakerson (1992), the jointness of the MAP resource is therefore zero (collection by one person directly influences the amount of resource available to others). Illegal collection by outsiders has been punished with a fine and confiscation of the collected material, but collectors from one VDC may purchase a permission to collect MAPs in other VDCs, just as they may buy permission to graze their sheep. The MAP resource is most abundant in Barpak, Kharibot, Sirdibas and Uhiya, and only in Kharibot are collection permissions not issued to outsiders.

Rules

The current CPR regime is based primarily on excludability of non-members, and specific rules on collection are few. In one ward of Kharibot VDC an area has been officially handed over for MAP management under the community forestry program (DFO 2000). Rules for this area include a ban on collection during 1995-2001, nursery establishment and plans for rotational collection from 2002 onwards. Hired guards (paid by an NGO) carry out intensive monitoring, and defection carries fines and confiscation of products. In the remaining areas local regulation of MAP collection involves fixed boundaries, sporadic monitoring, village meetings to decide the starting date for collection and purchase of collection rights by outsiders.

Members of the more wealthy households rarely engage in MAP collection, i.e. the village leaders who facilitate most of the decisions regarding the resource do not actually benefit directly from it. Among collectors there is widespread understanding that too early collection is harmful to regeneration, and although there is no official rule it is held that early collection is unwise.

Behaviour and individual cost-benefit

Generally, MAP collectors are found to observe the local rules on boundaries and starting date for collection, whereas the official ban on collection of panchaunle often is ignored. Some early collection of
Local Management of Medicinal and Aromatic Plants in Gorkha District, Nepal

*jatamasi* by shepherds is admitted to take place, but it is the general perception that most people wait. This may be as much a consequence of the agricultural labour cycle as of biological concerns. No action is taken against early collectors, and others do not consider their actions very harmful as they are few and collect small amounts.

NGOs previously working in the central area have suggested collectors to replant leaves and upper parts of the roots of *jatamasi* and *kutki* in order to facilitate regeneration. This practice would increase collection time by three times and decrease yields significantly, and since collectors are not convinced such practices may work they are not applied.

Individual discount rates are influenced by e.g. the expectance of reciprocity and the need for income. The norms for collective action found in this study means that discount rates should be low, because collectors are fairly certain that other collectors will respect the locally agreed rules. The fact that collectors engage in MAP collection only when cash is needed indicate relatively high discount rates, but the presence of locally respected boundaries in the alpine pastures also contributes to making collective action a rational strategy.

**Outcome of MAP collection**

The professed advantages of common property resource management are sustainable resource management and equitable distribution of benefits accruing from the resource.

No quantitative monitoring of the Nepalese MAP resource has been undertaken, and this makes verification of the first hypothesis difficult. Collectors in the central area of Gorkha District are disagreeing as to whether MAPs are degraded compared to 25 years ago. Collectors say that they have stopped collecting MAPs due to three factors: (i) less demanding income generating activities, such as trade, are becoming increasingly possible; (ii) scant information on MAP prices makes collectors unsure where to sell their products; and (iii) the fear of transporting the most profitable product (*panchaunle*) to the market.

In principle, all members of a community have access to the alpine pasture, and MAP collection should therefore be an equitable activity. However, the limited involvement of the *kami* suggests some inequity. Although all community members have the nominal right to collect MAPs, the *kami*’s access is limited by tacitly restricted information supply. Furthermore, local rules on MAP collection are set by local leaders not necessarily engaged themselves in the activity whose needs may differ from the collectors’.

**Conclusion**

High-altitude MAP collection in Nepal is said to degrade the resource, and central control is argued to be necessary for
sustainable management. But current central management, as specified in the Forest Regulations (HMG, 1995) has a number of flaws: (i) it is based on very limited data on national plant occurrence and plant biology; (ii) it does not take information on local plant populations into consideration; and (iii) rules are not enforced (as testified by widespread illegal collection and trade).

It is widely assumed in Nepal that there is no alternative to central management of the MAP resource, but as demonstrated by the current organization of MAP management in Gorkha District that is not true. The MAP resource is subject to local management, and although it may not be very apparent to outsiders the mechanisms of collective action work for this resource as for many others in Nepalese mountain villages.

Local management also has flaws. MAPs may be locally overexploited due to unclear tenure rights, lack of biological knowledge or the need for immediate income. But there are also some important advantages to local management: (i) it can be based on detailed knowledge about local populations; and (ii) locally accepted rules can be enforced.

If the high-altitude MAP resource is as threatened as many authors argue, radical action is needed to save both important biodiversity values and vital local income sources. Given the flaws of the current central management this will only happen if local collectors are involved. But given the flaws of local management mentioned above, this needs to be supplemented with knowledge and incentives that can only be provided by central actors. There is therefore a great need to combine the two forms of management in an approach that empowers local collectors to sustainably manage the MAP resource. Such an approach is not easy, but in this Nepal can draw on years of experience with the Community Forestry Programme.

Acknowledgement: The author is grateful to IDRC/MAPPA for the invitation to attend the Regional Workshop, Pokhara, Nepal.

References


Community Oriented Conservation of Medicinal and Aromatic Plants in the Garhwal Himalaya, Uttaranchal, India

Arun K. Badoni
Kiran Arun

Introduction

Medicinal and Aromatic Plants (MAPs) have long been playing a vital role in the life supporting systems of contemporary civilization by serving the purpose of maintaining good health and well being of mankind. Unfortunately during the past few decades the phyto-diversity is facing several man-made threats. These included destruction or modification of habit, over exploitation for commercial, scientific and educational purposes, overgrazing by domestic animals, extension of agricultural land, urbanization and other so-called developmental activities like construction of road, development of tourism industry, mining, etc. The plant populations are threatened also by various natural calamities like flood, drought, diseases, etc.

Apart from these, commercial exploitation of plants has become the most serious threat to natural populations, some prominent examples of the over-exploited medicinal plant species being Aconitum atrox, Aconitum heterophyllum, Allium spp., Bergenia ciliata, Barberis spp., Dactylorhiza hatagirea, Didymocarpus pedicillata, Ephedra gerardiana, Jurinea macrocephala, Mahonia napaulensis, Meconopsis aculeata, Megacarpaea polyandra, Nardostachys grandiflora, Picrorhiza kurrooa, Podophyllum hexandrum, Rheum australe, Saussurea costus, Swertia chirayita, Valeriana jatamansii, etc. Hence the prioritization of in-situ and ex-situ conservation and cultivation of many medicinal and aromatic plants (MAPs) have become most urgent.

SHER's Approach

The society for Himalayan Environmental Research (SHER) has been engaged in several aspects of Biodiversity Conservation and Sustainable Stable Development with particular reference to medicinal plants within Garhwal region in India. It includes six districts of Uttaranchal, viz. Chamoli, Dehradun, Pauri, Tehri, Rudraprauag and Uttarkashi. SHER’s ongoing activities pertaining to conservation and cultivation of MAPs are based mainly on activities like Fact Finding Tours (FFTs), Applied Research (AR) and Participatory Action Research (PAR).
Facts Finding Tours (FFTs)

In order to understand what is happening in the environment within the Himalayan regions of Uttaranchal, SHER has organized several FFTs to various difficult terrains, rich in medicinal and aromatic plants. These areas included Bhagirathi Valley, Tons Valley, Mandakini Valley, Yamuna Valley and also alpine meadows (bugyals) such as Panwali Kantha, Madmaheshwar, Kham, Marni, Hathni, Dayara, Gidara, Satopanth, Mahanir, Har-Ki-Doon, Valley of Flowers, Fateh Parwat, Chyangsheel, etc. In course of FFTs, survey of important medicinal and aromatic plants following random sampling technologies were undertaken and it was noticed that several taxa like Aconitum atrox, Aconitum heterophyllum, Podophyllum hexandrum, Polygognatum verticillatum, Picrorhiza kurrooa, Nardostachys grandiflora, Rheum australe and many others were on the verge of extinction.

SHER's interest has also been drawn towards the investigation on Traditional Systems of Medicine (TSM) and assessing their status. For this propose several field visits were conducted covering about 60 villages in 5 districts namely Pauri, Tehri, Chamoli, Rudraprayag and Uttarkashi. During these surveys some 70 professional traditional medicine practitioners (Vaidyas), 150 aged people having knowledge on TSM, 80 village women engaged in midwifery and many herdsmen were interacted. The information documented included information on 85 plant species being used to treat various diseases and ailments, methods of drug preparation, modes of uses, dose and course.

The survey team also collected a number of old manuscripts written in local languages concerning diseases and the herbal modes of their treatment. These local people also assisted SHER personnel in surveying their traditional harvesting localities that helped to understand the issue in considerable detail. It has been well realized that the only way to keep the traditional healing system functioning is the popularization of in-situ and ex-situ conservation of medicinal and aromatic plants in their habitats.

Applied Research (AR)

Considering the importance of conservation and cultivation of MAPs, SHER initiated the Applied Research (AR) program in order to develop cultivation practices for selected medicinal and aromatic plant species.

For this purpose, germplasms were collected from different parts of the Garhwal Himalaya. Living plants were transplanted at the Eco-laboratories. Plants were also raised from the collected seeds. Some sees were sown in the eco-laboratory of sub mountainous zone at Vikasnagar for experimental purposes. 150000 and 4,25,000 seedlings of economically important medicinal plant species were raised in nursery beds at Majhota tok in Dhatmir village and Shirolatok in Sidri village. Experiments
pertaining to multiplication of these species, comprised of vegetative propagation and seed germination under different concentrations of hormone, soil texture and sowing depth carried out in nursery sites and observed for sprouting of leafy shoot and survival percentage. The best methods were replicated for the large-scale production of planting materials. Finally experiments were conducted for the better production of useful plant parts.

The effect of NIAGARA on tuber cuttings of Aconitum atrox at 100 ppm concentration enhanced the percentage of sprouting in middle and lower segments in comparison to control in the nursery site. The fresh weight of tubers got enhanced under NIAGARA treatment at the end of first year, but no effect was observed in case of number of sprout particularly in lower and middle segments. Similar studies when conducted under demonstration site exhibited a large decrease in sprouting percentage under control as well as hormonal treatments.

The response of basal part of stems of Aconitum atrox, Aconitum heterophyllum, and Dactylorhiza hatagirea under 100 ppm concentration of NIAGARA showed a considerable increase in sprouting percentage in comparison to control. 12% of Aconitum heterophyllum plants reached the flowering stage within one year. The percentage of flowering was observed to be almost double with NIAGARA treatment.

NIAGARA at 50 ppm concentration enhanced the sprouting percentage in Podophyllum hexandrum, Paris polyphylla and Polygonatum verticillatum. The fresh weight of rhizome also increased with hormone treatment in comparison to control.

Application of STIK and GA3 on cut parts of dormant shoot buds of Dactylorhiza hatagirea showed that the length and gross weight of roots increased significantly but the natural shape of tuber (paw shape) was distorted completely.

GA3 at 100 ppm concentration significantly enhanced the germination percentage in Aconitum atrox, Aconitum heterophyllum, Saussurea costus and Selinum wallichianum. However, in case of Rheum australe GA3 treatment did not show any correlation. Ga3 treatment reduced the seed germination percentage in case of Valeriana jatamansii.

Germination of Aconitum atrox and Aconitum heterophyllum, observed under three textural groups of soil, exhibited a significant correlation. Sandy loam was found to be most conducive as far as growth and development of seedlings was concerned. However seed germination percentage was observed highest in silty loam type of soil. In silty clayey loam type of soil germination percentage was found to be almost half to that of silty loam. The fresh weight of roots also reduced gradually from sandy loam to silty clay loam.
Seeds of *Aconitum heterophyllum* sown at the depth of 0.5cm exhibited a very high germination percentage in comparison to seeds sown at the depth of 0.1 cm and 0.3 cm. The percentage of emergence of true leaf as well as fresh weight of roots also increased with increased depth from 0.1 to 0.5 cm.

These experiments resulted in the development of agro-technologies for some promising MAP species, and produced enough planting materials ready for transplantation in the field.

Participatory Action Research: (PAR)

This program has been initiated for enhancing community oriented Sustainable Biodiversity Management. The local people have been convinced that:

- Medicinal and aromatic plants are important source for their subsistence living,
- There is a big gap between supply and demand, the demand exceeding the supply, and
- Local communities are the integral parts of biodiversity conservation and management programs, and the local people can guide, consul, cooperate or withhold cooperation.

The following are the main activities regarding the conservation, consciousness on MAPs and their cultivation so far conducted under the PAR program of SHFR:

- Organization of several programs on Medicinal Plants Conservation Education (MPCE) for students at schools, collages, and university levels,
- 15 lectures, benefiting 2148 participants,
- 8 Essay Contests concerning the status and conservation of Himalayan MAPs, participated by 95 participants,
- 5 Quiz Contests with 25 participants,
- 6 Medicinal and Aromatic Plant (MAPs) species plantation programs at the campus of different institutions,
- 6 Seminars with 790 participants,
- 5 Workshops with 130 participants,
- 2 Sangosthi with 250 participants,
- 3 Exhibitions during local festivals with 8500 visitors,
- Organization of awareness program for the advocacy of in-situ and ex-situ conservation and cultivation of MAPs amongst the people of different sects at regional levels,
- Organization of Eco-camp for villagers, forest dwellers and tribal communities of the region to understand the effects of uncontrolled exploitation of MAPs as well as to generate willingness for the ex-situ conservation of important medicinal plant species through cultivation. This covered about 25 villages with the participation of 2000 local inhabitants.
Organization of Training for Trainers (OTFT) for the dissemination of technology pertaining to the multiplication and propagation of MAPs:

- 5 OTFT organized at SHER sites with 120 participants from government institutions and NGOs,
- 2 OTFT organized at other institutions with 50 participants.

Organization of Get-together programs (Gosthi) for the local herbal practitioners for sharing their knowledge regarding traditional medicinal strategies and rejuvenation and strengthening of TSM based on MAPs:

- 3 Gosthi organized with the participation of 18 local herbal practitioners (Vaidyas).

Organization of village level meetings, debates and camps for the promotion of TSM with the help of resource persons and local herbal doctors:

- 15 camps organized with the participation of 667 villagers,
- Organization of TRUGA (Training for Rural Gainful Activities) camps related to MAPs in which several method of medicinal plants multiplication as well as technical know-how obtained from the Applied Research Program was imparted to the progressive farmers selected from different village during the Eco-camps. The participants were also trained in the sagacious management and rational exploitation of existing resources for the preparation of different products from wild edibles like Hippophae, Rhododendron, etc. Five TRUGA Camps organized so far has benefited 160 participants.

**Outcomes**

- More than 21,000 people have been benefited with knowledge regarding the utility potentials and conservation needs of MAPs and herbal health care systems.
- Preparation of several products from wild edibles coupled with technical assistance regarding herb cultivation for uplifting the local communities' socio-economic status has been carried out.
- At present 28 farmers are engaged in the cultivation of a number of important medicinal and aromatic plant species like Aconitum atrox, Inula racemosa, Picrorhiza kurrooa and Saussurea costus.
- Nearly 250 villagers are ready for the initiation of commercial cultivation of MAPs on their private land.

**Acknowledgements:** The financial assistance provided by Medicinal and Aromatic Plants Program in Asia (MAPPA), International Development Research Centre (IDRC) for this project is gratefully acknowledged. The authors are also grateful to IDRC/MAPPA for the invitation to attend the Regional Workshop, Pokhara, Nepal.
Conserving Medicinal Plants in Southern India

Ravi Kumar

Why Conserve Medicinal Plants?

Ecological value:
Medicinal plants occur in all biogeographical zones.

Cultural value:
India has rich medicinal heritage (e.g., Ayurveda, Siddha, Unani, Folk, etc.).

Economic value:
Medicinal plants constitutes 50% of the flowering plants;
About Rs. 23,00,00,000 turnover/year through export

Conservation and Management Plan (CAMP):

- A most cost effective and rapid assessment to prioritize medicinal plants and assign threat status, based on IUCN guidelines

- Experience gained through successive Conservation Assessment and Management Planning (CAMP) workshops has resulted in assigning Red List Status to 110 medicinal plants in three southern Indian states

- This process can be fruitfully utilized to establish Medicinal Plants Conservation Areas (MPCAs) to capture the maximum number of medicinal plants

Programs:

In-situ Conservation: This will help conserve inter- and intra-specific medicinal plant diversity

Three Models:

1. Medicinal Plants Conservation Area (MPCA) model
2. Medicinal Plants Development Area (MPDA) model
3. Non-Timber Forest Produce Area (NTFPP) model

Ex-situ Conservation:

1. Medicinal Plants Conservation Program (MPCP)
2. Revitalization of Local Health Tradition (RLHT)

Operational Features of the MPCA Model

1. A network of about 10 to 15 conservation sites per state
(depending on the size of the state), 200 to 500 hectares each; officially notified as MPCAs

2. Sites located in relatively undisturbed forests across different vegetation types, at different altitude ranges, soil types and rainfall

3. MPCAs are visualized as “no harvest” sites

**In-situ Conservation Sites (MPCA)**

**Criteria for selection:**

1. At least one area in each major forest type and across different altitudinal zones

2. Areas easily accessible to public

3. Easily manageable, around 200 – 500 ha./site

4. Historically / traditionally known areas for rich medicinal plant diversity (Kolli Hills, Kutralam [Tamil Nadu], Kodachadri Hills – Kollur [Karnataka], Agastiarmalai [Kerala]

5. Should not affect the livelihood of locals

**MPCA forest types:**

1. Southern moist deciduous forest

2. Southern dry mixed deciduous forest

3. Southern montane wet temperate forest

4. Tropical dry evergreen forest

5. Tropical dry evergreen scrub

6. West coast semi-evergreen forest

7. Dry deciduous scrub

8. Southern hilltop tropical evergreen forest

9. Southern thorn forest

10. West coast tropical evergreen forest

**Field survey:**

- After establishing MPCAs, repeated intensive botanical surveys have been conducted at all the sites in different seasons so as to collect flowering and fruiting material of all the plants

- They were identified in the field – by referring relevant floras

- Herbarium specimens were collected, processed as per international standards

- Critical identification for certain species have been done by confirming/matching with the herbaria at MH, BSI and others

- Botanical studies across the MPCA network will provide reliable information on the presence, distribution and distribution pattern of medicinal plants across the various forest types in the state and correlate their occurrence with various ecological parameters like soil type, soil pH, rainfall pattern and altitude range
Conserving Medicinal Plants in Southern India

- So far 30 MPCAs have been established as conservation sites
- 6 to 30 Red List species were captured in each site
- To fill the gap in conservation of Red Listed species, several other MPCAs have to be established
- Two more MPCAs have been recently established

### Kollur Medicinal Plants Conservation Area (MPCA)
- Number of species collected: 160
- Number of species recorded: 124
- Total number of species (collected + recorded): 284
- Number of medicinal plants: 86 (160)
- Red listed species: 30

### Kulamavu Medicinal Plants Conservation Area (MPCA)
- Number of species collected: 170
- Number of species recorded: 148
- Total number of species (collected + recorded): 318
- Number of medicinal plants: 72 (170)
- Red listed species: 24

### Inside the Herbarium
- FRLHT, today has one of the most comprehensive medicinal plants herbaria in India

- Medicinal and non-medicinal plants across 32 MPCAs in southern India
- 20,000 sheets
- 8,369 records
- 2,502 species
- 1,555 Medicinal species
- 80 Red Listed species (out of 110 in S. India)
- This herbarium is supported by Raw Drug Museums (770), Eco-distribution maps (120), Trade data (1200), Propagation information (278) plus visuals (4000)

### Management Focus:

It is possible to undertake several types of activities at a conservation site, which have to be managed effectively. These activities are:

- Conservation Education focused on High visitor frequency
- Field Research focus on more of Red Listed species
- Local Community focused on Community Participation
- Nursery outreach focus on Easy access to public

### Conservation Education:

Medicinal Plants Conservation awareness among visitors through:

- Development of Nature Trails
Demonstration Gardens
Interpretation Centers
Nature Camps
Training to women self-help groups (SHGs) to use medicinal plants
Train the local resource persons to serve as guides
Income generation/value addition activities

Field Research:
Mere establishment of conservation sites will not ensure the conservation of Red Listed Medicinal Plants
A systematic attempt to understand the bottlenecks of the survival of the Medicinal Plants through Conservation Biological Studies help to mitigate the threats and ensure survival of the species

Research Institutes:
ATREE, Bangalore
IFGTB, Coimbatore
TBGRI, Palode

Field Research:
Species Recovery:
For detailed field research activities, 6 research sites were selected (new site at Kulamavu to be assigned to C. fenestratum)
Field research being conducted on various aspects of conservation biology such as species distribution, population dynamics, reproductive biology, genetic variability and regeneration potential of 45 Red Listed species

These studies aim at developing suitable management strategies plus guidelines for species recovery program by identifying the bottlenecks of species survival and mitigating their survival threats

Nursery Outreach:
Supplying planting materials to both non-commercial and commercial users through a network of medicinal plant nurseries and seed centers.

Ex-situ Conservation:
Indirect conservation
Managed by NGOs
Has components like EMF, HSRD, Nursery Outreach

Acknowledgement: The author is grateful to Medicinal and Aromatic Plants Program in Asia (MAPPA), International Development Research Centre (IDRC) for the invitation to attend the Regional Workshop at Pokhara, Nepal.
Threatened Medicinal Plants of Maharashtra State, India

P. Tetali

SUMMARY

The first Conservation Assessment and Management Plan (CAMP) exercise on threatened medicinal plants of Maharashtra province, India was held between 24-25 September 1998. Naoroji Godrej Centre for Plant Research (NGCPR) organized the exercise in collaboration with Department of Botany, University of Pune.

Out of 183 species of medicinal plants considered for the CAMP exercise, 26 species belonging to 23 genera and 18 families were considered threatened in the wild and each species was assigned a threat status. Among the 26 threatened species, 1 species is Critically Endangered (CE), 12 species are Endangered (E) and 13 species are Vulnerable (V). Considering the part used, 12 species are harvested for their root, 3 species for their leaves, 3 species for their flowers, 3 species for their fruits, 3 species for their seeds, 1 species for its bark and root, and 1 species for its seeds and corms. A comprehensive list of the threatened medicinal plants of Maharashtra has been presented in Table 1.

Acknowledgements: The author expresses his gratitude to IDRC (MAPPA) for the invitation to present this paper. Mr. Darshan Shankar of Foundation for Revitalization of Local Health Traditions (FRLHT), Bangalore is acknowledged for his support with technical information to organize the Maharashtra CAMP workshop successfully.
Sharing Local and National Experience in Conservation of Medical and Aromatic Plants in South Asia

Table 1. Threatened Medicinal Plants of Maharashtra

<table>
<thead>
<tr>
<th>Plant species</th>
<th>Family</th>
<th>Threat status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Bidaria khandalens (Sant.) Jagtap &amp; Singh</td>
<td>Asclepiadaceae</td>
<td>Endangered</td>
</tr>
<tr>
<td>2. Calophyllum apetalum Willd.</td>
<td>Guttiferae</td>
<td>Vulnerable</td>
</tr>
<tr>
<td>3. Canarium strictum Roxb.</td>
<td>Burseraceae</td>
<td>Endangered</td>
</tr>
<tr>
<td>4. Chlorophyllum borivilianum Sant. &amp; Fernadez</td>
<td>Liliaceae</td>
<td>Endangered</td>
</tr>
<tr>
<td>5. Cinnamomum verum Persl.</td>
<td>Lauraceae</td>
<td>Endangered</td>
</tr>
<tr>
<td>6. Costus speciosus (Koen. ex Retz.) Sm.</td>
<td>Zingiberaceae</td>
<td>Endangered</td>
</tr>
<tr>
<td>7. Dysoxylum malabaricum Bedd.</td>
<td>Meliaceae</td>
<td>Vulnerable</td>
</tr>
<tr>
<td>8. Entada rheedi Spreng.</td>
<td>Mimosaceae</td>
<td>Endangered</td>
</tr>
<tr>
<td>9. Eulophia nuda Lindl.</td>
<td>Orchidaceae</td>
<td>Endangered</td>
</tr>
<tr>
<td>11. Euphorbia panchganiensis Blatt. &amp; Mc Cann.</td>
<td>Euphorbiaceae</td>
<td>Endangered</td>
</tr>
<tr>
<td>12. Gymnema montanum (Roxb.) Hook. f.</td>
<td>Asclepiadaceae</td>
<td>Vulnerable</td>
</tr>
<tr>
<td>13. Hynocarpus pentandra (Buch.-Ham.) Oken.</td>
<td>Placourtiaee</td>
<td>Vulnerable</td>
</tr>
<tr>
<td>14. Iphigenia magnifica Ansari et Rolla Rao</td>
<td>Liliaceae</td>
<td>Vulnerable</td>
</tr>
<tr>
<td>15. Iphigenia pallida Baker</td>
<td>Liliaceae</td>
<td>Vulnerable</td>
</tr>
<tr>
<td>16. Iphigenia stellata Blatt.</td>
<td>Liliaceae</td>
<td>Vulnerable</td>
</tr>
<tr>
<td>17. Kaempferia galanga L.</td>
<td>Zingiberaceae</td>
<td>Critically Endangered</td>
</tr>
<tr>
<td>18. Kandelia candel (L.) Duce</td>
<td>Rhizophoraceae</td>
<td>Vulnerable</td>
</tr>
<tr>
<td>19. Lobelia nicotianaefolia Roth. ex Roem. &amp; Schutt.</td>
<td>Campanulaceae</td>
<td>Vulnerable</td>
</tr>
<tr>
<td>20. Mesua ferrea L.</td>
<td>Guttiferae</td>
<td>Vulnerable</td>
</tr>
<tr>
<td>21. Myristica malabarica Lam.</td>
<td>Myristicaceae</td>
<td>Vulnerable</td>
</tr>
<tr>
<td>22. Nervilia aragoana Gaud.</td>
<td>Orchidaceae</td>
<td>Endangered</td>
</tr>
<tr>
<td>23. Nothapodytes nimoniana (Garh.) Mabb.</td>
<td>Icacinaceae</td>
<td>Endangered</td>
</tr>
<tr>
<td>24. Oroxyllum indicum (L.) Kurz.</td>
<td>Bignoniaceae</td>
<td>Vulnerable</td>
</tr>
<tr>
<td>25. Pueraria tuberosa DC.</td>
<td>Fabaceae</td>
<td>Vulnerable</td>
</tr>
<tr>
<td>26. Rauvolfia serpentina (L.) Benth. ex Kurz.</td>
<td>Apocynaceae</td>
<td>Endangered</td>
</tr>
</tbody>
</table>
Sustainable Model for the Conservation and Promotion of Non-timber Forest Product Species: Experiences from Chhattishgarh State, India

J.A.C.S. Rao

SUMMARY

The conservation, promotion and propagation of NTFP is very much possible in the natural forest areas as well as outside it. It results in the promotion of biodiversity and subsequent rural income generation activities. An effort has been made in Raigarh district, Chhattishgarh, India to conserve, manage and develop biodiversity with special reference to NTFP through in-situ and ex-situ conservation in degraded forests, waste lands and saranas. Saranas are the sacred grooves strictly protected and worshipped by the local tribal and represent ideal patches of biodiversity conservation sites.

The proposed model involves site specific operations viz., multi-tier plantations, silvicultural operations involving community based organizations (CBOs) for the sustainable use of deformed and malformed trees, transplantation of NTFP species, seed dibbling and dispersal of the targeted NTFP species in all the potential habitats. These sites function as a buffer zone to fulfil major proportion of local demands and lessen the biotic pressures on other forest/NTFP rich areas. Hence they are also meaningful to contribute in the conservation of Red Listed species. In these sites, sustainable harvesting can be adopted for fulfilling local needs together with considerable income generation.

The major components of the model included in-situ and ex-situ conservation, and development of NTFP grooves. With in-situ conservation, the vast stretches of biodiversity-rich forests are protected, conserved and managed. In case of ex-situ conservation biodiversity-rich forest pockets are managed and promoted through multi-tier plantation with economically viable NTFP species including herbs, shrubs, climbers and trees. The development of saranas, the sacred grooves, into NTFP grooves were attempted which responded well. All the aforesaid components have direct impacts on biodiversity conservation, NTFP promotion and local-level income generation.

In case of in-situ conservation, results obtained were conspicuous from the very first year of the initiative. Sustainable harvesting was possible along with
simultaneous promotion of certain species like *Asparagus racemosus*, which is in abundance. With the ex-situ conservation initiative, considerable income generation has become possible together with conservation effects. Saranas, the sacred grooves, provided remarkably encouraging responses and they have become enriched centers of biodiversity. The sacred grooves modified into NTFP grooves responded well with patches of NTFP species. The results of all the three components are promising.

On the whole, the proposed model contributed in the conservation of biodiversity in general and in the conservation, promotion, propagation and sustainable management of NTFPs in particular, enhancing income generation potentialities as well.

**Acknowledgement:** Invitation from IDRC/MAPPA for participation in the Regional Workshop, Pokhara, Nepal is highly appreciated.
POSTER PRESENTATIONS

STRATEGIES FOR EQUITABLE COMMERCIALIZATION
Commercial Use of Biodiversity and Equity: Are They Compatible?

Bhishma P. Subedi
Hemant R. Ojha*

ABSTRACT

Subsistence use biodiversity alone is not adequate to address the issue of rural livelihoods and create incentives to stakeholders in conservation. The growing global demand for natural products including medicinal and aromatic plants (MAPs) is posting both opportunities and challenges for the sustainable and equitable use of these resources. This paper examines the relationship between commercialization and social equity in this sub-sector. Equity within community as well as between community and other business stakeholders in the sub-sector is analyzed by reviewing the various forms of community-based enterprise initiatives that exits in Nepal. The paper concludes that mere market-driven commercialization does not guarantee equity without favorable policy environment and appropriate technical services.

Key words: commercial use, biodiversity, equity, medicinal and aromatic plants, Nepal

I. Introduction

Forest resources are an integral part of livelihood support system in Nepal, where an overwhelming majority of the 20 million people live in the interface between forest and agriculture. There are very few economic opportunities for the population of hill mountain areas, non-timber forest products (NTFPs) play a crucial role in the livelihood strategy of these people.

The demand for Nepal’s NTFPs is growing in the natural products markets at the regional as well as global level. The commercialization of these products offers an opportunity to not only local communities but a number of business stakeholders that adds value to the products and delivers the end products to the hands of consumers. If community members do not feel the benefits are being distributed fairly there will be less incentive to product the natural resources. The overall raw material source could become threatened as well as the commercial activity and the biodiversity.

* Mr H. R. Ojha, Asia Network for Small-scale Agricultural Bioresources (ANSAB), Kathmandu, Nepal
There is a paucity of data and analysis regarding the scale of business, business function, benefit distribution and other economic characteristics related to the NTFP industry in Nepal. We have drawn for our experiences working with several community-based enterprises as well as other business stakeholders around the country to assess the distribution of benefits from the commercial use of country’s biodiversity. A list of such enterprise initiatives and sources of information that formed the primary basis for the discussion and analysis is presented in Table 1.

Table 1. Enterprise Cases and Sources of Information:

<table>
<thead>
<tr>
<th>Enterprises</th>
<th>Sources of Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humla Oil Private Limited</td>
<td>Enterprise development plan, ANSAB enterprise study 2000, enterprise records, semi-structured interview with enterprise leaders and staff</td>
</tr>
<tr>
<td>Malika Hand-Made Paper Private Limited</td>
<td>Enterprise development plan, ANSAB enterprise study 2002, enterprise records, semi-structured interview with enterprise leaders and staff.</td>
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<tr>
<td>Bhitteri Pakha Argeli Processing Enterprise</td>
<td>Enterprise development plan ANSAB enterprise study 2000, Himalayan Bioresources - March 2000, interview with enterprise leaders and staff</td>
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<tr>
<td>Individual paper Producers in Baglung</td>
<td>BCP reports, ANSAB field trip reports</td>
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<td>Pandit Kamala</td>
<td>ANSAB office records, Enterprise development plan</td>
</tr>
<tr>
<td>Janaki FUG Enterprise</td>
<td>Himalayan Bioresources - March 2000, ANSAB enterprise study 2000</td>
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<tr>
<td>Gaukhureshwor FUG Enterprise</td>
<td>ANSAB training report, field observation, discussion with FUG leaders ANSAB enterprise study 2000, interview with the entrepreneur</td>
</tr>
<tr>
<td>A landless cardamom grower in Ilam</td>
<td>ANSAB field trip reports</td>
</tr>
<tr>
<td>Individual paper entrepreneurs in Dolakha</td>
<td>ANSAB field trip reports</td>
</tr>
<tr>
<td>Deudhunga Multipurpose Cooperative</td>
<td>Enterprise development plan, interactions with enterprise partners</td>
</tr>
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<td>Leasehold forest and forage user groups</td>
<td>Project reports, interaction with project staff</td>
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<tr>
<td>Herbs Production and Processing (HPPCL)</td>
<td>Interaction with company staff, company presentations</td>
</tr>
<tr>
<td>Gorkha Ayurved Company</td>
<td>Nepal NTFP Newsletter, 1996</td>
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<td>Nepal Paper Products (NPP)</td>
<td>Interaction with company staff</td>
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<td>Praja NTFPs Coop, Chitwan</td>
<td>ANSAB enterprise study 2000, interaction with project and enterprise staff</td>
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<td>Bhaktapur Craft Printers (BCP)</td>
<td>Workshop reports, ANSAB’s field trip reports</td>
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</table>
This paper attempts to address the following key questions:

- Who are the business stakeholder groups in the NTFP sub sector and how do these groups vary in terms of socio-economic characteristics?
- What is the business function scales, opportunities and challenges of each of these stakeholders?
- What is the current pattern of benefit distribution among these stakeholders and what are the factors determining the pattern?

Overview of NTFP Enterprises:

Global market for Nepal’s NTFPs are big and the demand trend for these products is increasing, as more and more people from developed country are attracted to natural products. An ANSAB survey found that about 100 entrepreneurs handled approximately 42 thousand tons, consisting of more than 100 different NTFP items in 1995. This amounted to more than 1.5 billion Nepali Rupees (equivalent to US $26 million) in 1995 (Subedi 1997). Even this conservative estimate shows that commerce involving NTFPs is contributing significantly to the Nepalese economy.

NTFP enterprises exist in various modalities, which can be outlined in terms of ownership structure, linkage to raw materials, target market, seasonality of operation, technological sophistication, management structure, product types and similar characteristics. Five main categories of ownership structure exist (sole, FUG, coop, private limited, limited company). A consortium of FUGs is somewhat different from FUG alone and coop. FUGs have emerged as a very strong local institution for facilitating economic activities in the group as well as nearby communities. Some of them have undertaken well-planned enterprises while others have carried out discrete activities that enhance the economic well being of the community members. FUGs are owned and managed through a two-tier structure of Assembly and Executive Committee, and are legally recognized as self-governed institutions managing community forests through approved forest management plans.

In terms of linkage to raw materials, most economic and enterprise activities are based on raw materials drawn mainly from state controlled national forests and community forests. A limited supply comes from private land.

Many of the community-based enterprises focus on domestic markets. Most products are exported abroad to Europe and America by a few processors and traders. Regional and national enterprises differ from community-based forestry enterprises in terms of scale of production, target market (usually focusing international markets) and sophistication of management.

In respect to products lines, enterprise initiatives exist in almost all possible products lines that include essential oils,
Ayurvedic preparations, cosmetics, toiletries, handmade papers, medicinal and aromatic products, wild mushrooms, herbal teas, spices and other NTFPs. Several processors and manufacturers (such as HPPCL, Singha Durbar Vaidyakhana, Dabur, NPI, Gorkha Ayurveda Company) produce a number of items with international markets.

From the technological point of view, many use simple and locally available technologies. Some process and manufacture the products physically while others add value simply by changing the trade location, such as the Janaki FUG. The more sophisticated the technology, the more difficult it becomes for the community to manage the enterprise.

Enterprises also differ in terms of seasonality of operation. Those that collect NTFPs and sell the crude form to traders have a limited operation season, usually confined to a few winter months. Papermaking enterprises generally operate in the summer and other sunny days if the raw material supply is plentiful.

II. Business Stakeholders and Equity Dimensions

The NTFP sub-sector involves business stakeholders who might be positively or negatively affected by the sub-sector and/or have influenced it at varying degrees of scale, power and interest. These stakeholders can broadly be grouped into internal and external categories depending on whether they are residents of communities where NTFPs are produced. Local harvesters, community forest user groups (FUG), villager level traders, local NTFP cooperatives and local level processors are internal stakeholders. Road-head/airport traders, regional traders, large-scale processors, manufacturers and retailers are external stakeholders.

All stakeholders are linked through a value chain involving the flow of products (originating from natural resources base) and the money (originating from the end user). There are also other stakeholders in the sub-sector that facilitate or regulate the business functions in the value chain. More relevant in equity analysis are business stakeholders. Issues of equity should be analyzed both within and between these stakeholders.

Equity is an economic variable, in terms of how evenly benefits are distributed among business stakeholders. Equity should have some normative component, a fair pattern of benefit distribution. An equitable benefit distribution pattern should favor low-income groups and stakeholders producing social benefits and pay adequate for the value of the biodiversity. It may be argued that an equitable NTFP industry favor the low income groups such as local harvesters, village traders and other internal business stakeholders who represent social groups of the lower income bracket. From the social benefit point of view, local harvesters and FUG are engaged in
resources conservation that yields a wide array of external social benefits. FUGs can therefore demand a fair return to compensate for their costs. This is not only socially just but also creates added incentives to preserve the natural resource base, upon which the incomes of other stakeholders depend. Finally, when local harvesters and/or FUGs are considered legitimate owners of forests, the prices

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Principle socio- Economic characteristics</th>
<th>Business functions</th>
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<tbody>
<tr>
<td>Local Harvester</td>
<td>Represent poorer groups of community including children, Harvester women, elderly disadvantaged people; obtain seasonal employment and incomes to meet critical livelihoods requirements; have limited knowledge of and exposure to marketing and entrepreneurship.</td>
<td>Harvesting mainly from wild, preliminary cleaning, drying, storage and transportation; scale of business ranges between Rs. 10,000 and 50,000. Forest User</td>
</tr>
<tr>
<td>Forest User Groups (FUGs)</td>
<td>Recognized as a self-governed local institution for forest resources management; mostly heterogenous (economically and politically) social groups living in various settlements, members have diverse needs and expectations from the forests; common and formal rules may ignore the interests of specific NTFP interest group; generally lack business orientation.</td>
<td>May undertake business functions including harvesting, trading, recourse management, regulations, and local processing.</td>
</tr>
<tr>
<td>Village Traders</td>
<td>Represent elites and well-offs within community including leaders and teachers but poorer in the national context; obtain products in credit from harvesters and also provide advance payments (received from original traders); generally work in a low profit margin; have some exposure to the market as well as knowledge about resources.</td>
<td>Storing, Preliminary packaging and drying and providing skills and techniques (such as harvesting, drying, storage) to FUG and local harvesters; business scale is to Rs. 50,000 to 100,000.</td>
</tr>
<tr>
<td>Local Processors</td>
<td>Represent collectors, FUGs and local traders, generally use easily accessible technologies generally aiming at reducing weight, volumes and cost of handing and transportation.</td>
<td>Simple processing such as drying fiber extraction, handmade papermaking and sometimes distribution; business scale up to Rs. 1,500,000.</td>
</tr>
<tr>
<td>Retailers</td>
<td>Vary form small businesspersons exclusively dealing with herbal medicines, wild vegetables, spices, etc to large business house dealing with finished goods, party or wholly composed of NTFPs, in large cities.</td>
<td>Retailing; scale of business vary from very small to over a million rupees.</td>
</tr>
</tbody>
</table>
they obtain from their NTFPs should also include the value of the resource, not merely the cost of extraction.

**Internal Stakeholders**

Ideally, commercialization should yield proportionately better returns to community-based stakeholders. A comparative analysis of socio-economic characteristics of these stakeholders, their business positions and functions is summarized in Table 2. A brief description of this analysis is also presented.

The stakeholders living in the communities closest to the sources where NTFPs; are produced are generally poor, living at or below the poverty line, and heavily dependent on the surrounding natural resources such as forests and pastures for their livelihoods.

**Local Harvesters:** Local harvesters live within communities near natural resources areas. They represent poor and medium classes including children, women, elderly and disadvantaged people. They meet a significant portion of the household incomes from NTFR collection. This seasonal employment generates about 30/50% of their total household incomes (that supports 3-6 months requirement for food, festival expenses and the two basic food items to be purchased – salt and cooking oil).

Local harvesters collect NTFP from forests, alpine pastures and rocky areas. They often walk 2-5 days passing the nights in caves, climbing steep slopes and coping with extreme cold with insufficient clothing. Sometimes customary laws do not allow lower caste groups to collect natural products in specific locations (such as Malika area, Bajhang district). Lower caste groups undertake cleaning, drying and storage of collected products in the houses in a traditional way.

Scale of business goes up to an annual sales turn over of generally Rs10, 000 to 50,000. Several risks that surround the business included changes of accidents (wildlife, calamities), damages and loss (due to decaying, wastage, leakage), risk if sale and price reductions.

**Forest user groups (FUGs):** FUGs are self- governed local institutions and recognized legitimate user and manager of community forests. They earn money from NTFP trade as taxes as well as revenues, and spend the money in variety of community services. Economically and politically heterogeneous members within FUGs have diverse needs and expectations. The common and often formal rules hardly favor the interest of the specific NTFP interest groups, which include harvesters, small traders and local herders. FUG leadership usually has poor representation from the poor and disadvantaged group. Therefore, services created through FUG investments are not always equally accessible to all income groups within the community. More consolidated equity sensitive enterprises and strategies need to be adopted by FUGs to achieve a more favorable equity impact.
Most FUGs have yet to incorporate NTFP provisions into the forest management operational plans (OP), and hence have practically no control over such commercial products. In such cases, outside traders get local harvesters to extract the products from community forests under DFO permissions. FUGs with NTFPs with NTFPs incorporated in the OP can issue permission to local harvesters, and in some cases (such as Janaki FUG in the far-western Nepal) conduct organized trading of raw NTFPs to regional traders (such as those in Nepalgunj). Other business functions that FUGs started to undertake include local processing and marketing. Despite a few sporadic initiatives, business thinking and motivation has been a complex issue for FUGs.

**Village Traders:** Village traders are relatively well-off members of the communities, have stronger social capital in terms of linkages with downstream traders and have a fairly good exposure to NTFP marketing channels level. The prime economic objectives of village traders are partly higher up to the need hierarchy compared to the local harvesters. They also fall into the poor and deprived group in the national context.

They generally do not invest money of their own, and they operate like agents of road-head and regional traders. They often provide some advanced payments and also obtain products in credit from harvesters. They have relationships with particular groups of local harvesters as well as road-head or airport traders, and sometimes with regional traders. Usually, they provide skills and techniques (such as harvesting, drying and storage) to FUGs and local harvesters. Overall, local communities have mixed impressions of these traders, in some cases as cheaters and in other cases as contributors in marketing of NTFPs. They operate in low profit margin (ANSAB 1999) and the business scale is generally a working capital of Rs 50,000 to 1000,000.

**Local Processors:** A FUG, a village trader or a community-based company may do local processing. FUG and village trader cases have already been mentioned. Community based companies undertaking processing functions are also increasing in number around the country. The equity implications depend on how enterprises employ people, source raw materials through collectors, to whom they sell the products and to whom they compete with in terms of raw materials procurement as well as product sales. Business scale reaches up to Rs 1,500,000.

**Local NTFP Cooperatives:** This structure represents organized groups of collectors (generally formed through outside interventions), usually registered and eligible for certain state subsidies but not generally encouraged to do export business. They also represent poorer community groups. Examples of this group include Praja NTFP Coop in Chitwan and Allo Cloth Production Club in Sankhuwasabha. Their main business functions include collection, processing
and trading. The business has generally a scale of up to Rs 100,000.

External Stakeholders

The stakeholders in this category are generally economically well off and/or politically powerful people in the national context. Their trade or enterprise has a goal of earning money to meet comfort and luxury beyond basic needs. These groups are generally educated, have exposure to the national as well as international marketing environment and can exercise better political power to safeguard their business interests.

NTFP business is one of several options for them, particularly for regional traders. Manufactures and exporters are generally public or private companies enjoying the protection of business in national and international dealings. They do not have any direct affinity with the resource base of the products. Their innovations in terms of finding a new market, developing new products and others can also have a bearing on the distribution of benefits between themselves as well as between them and community based business stakeholders.

Road-head and Airport Traders: This category represents wealthy, educated and local elite (political leaders, service holders and businessman) who has the ability to work in complex administration environments. They have a good exposure and knowledge of NTFP markets, and often operate in strong horizontal competitions. They are positioned at points where bulk transportation is possible. Their scale of business runs up to Rs 500,000.

Regional traders: They represent traders with a higher investment capacity and often are members of traditional business groups. They often have multiple supply linkages with local harvesters, village traders and road-head traders. They can exercise high political influence and have smooth access to business services/inputs. They often form cartels to safeguard their interests. Jari-Buti Association of Nepal (JABAN) is an example of this form of trader’s association. Their main business functions include packaging and selling out to manufactures and Indian traders. They may also directly export to the third countries. Their business scale can be as high as Rs 20 million.

Exporters: This group includes a few educated and professional traders having international market access. These traders have exposure have on international market and knowledge and skills handling export and import regulations including the issue of certification. They often have specific market linkages. Their transactions and communications are sophisticated and involve the use of electronic media. They often have a good business culture and professionalism, and this gives them a competitive advantage to deal with international buyers. They undertake grading, cleaning, drying and packaging before exporting the products. Their business scale is around Rs. 25 million.
**Big Processors and Manufacturers:** Processing and manufacturing is still in its infancy in Nepal. They represent national companies, both public and private. There include HPPCL (products from essential oils), NPI and BCP (products from hand-made Nepali paper), Gorkha Ayurveda, SDBK, and Dabur Nepal (Ayurvedic preparations). They have strong legal backing but most of them are facing internal (management) and external (marketing) challenges. They have a great scope of providing employment and developing new natural products that can fetch better prices in international markets.

**Retailers:** Retailers vary from small businesspeople exclusively dealing with herbal medicines and spices to large business houses dealing with finished goods, partly or wholly composed of NTFPs, in large cities. Examples include Ayurvedic medicine shops, groceries containing tea, herbal dyes, bamboo and rattan product retailers, sal leaf plate retailers around temples and marketplace, and others. As the consumer products from NTFPs are limited, the presence of these stakeholders is also low in Nepal. The scale of business may vary from a few thousand to a million rupees.

**Current Pattern of Benefit Distribution**

The present socio-economic, regulatory, technological and market structure is not providing the fair share of profits to all national stakeholders generally and within the country to local harvesters. The current pattern of distribution is uneven with a generally high return to external stakeholders, and a low return to external stakeholders.

At the international level, Iqbal Choudhary (1995) found the striking pattern that developing countries are the major producers and exporters of raw of semi-processed and developed, industrialized countries are the major importers and enjoy high profits.

At the national level, based on an average of 13 products traded from catchments in the far-west, central and east Nepal, Edwards (1996a) found that harvesters of NTFPs receive only 32% of the final price in India. In a recent sub-sector analysis based on data from the Karnali zone, regional traders followed by airport traders generate the largest profit (Table 3). It is astonishing that one villager trader's profit is 58 times higher than that of a harvester. A road-head trader earns more than 1000 harvesters of 17 village traders can earn. Likewise, regional trader's profit is 4307 times higher than that of a harvester, 73 times of a village trader of road-head trader. Given the similarity of the context, similar pattern of benefit distribution can be found in other parts of the country in the sub-sector. For some products the price received by local harvesters is less than their labor charges.

Note: The total profit was estimated after evaluating the total quantity of NTRPs
traded in the Karnali zone. It was assumed that for the selected species, Karnali zone was the only supply source for Nepalgunj traders. The profit per person is given by the total estimated profit dividing by the estimated number of actor in each part of participants.

III. Factors Affecting Benefit Distribution

As presented in the pervious sections, the distribution of benefits and burdens from an enterprises is not fair from both social and conservation point of view. This can be explained from the prevailing business environment is the sub-sector including the characteristics of stakeholders themselves, policy and regulatory environment, market conditions, and available technology and services. The factors that may affect the distribution of benefits within and between enterprises stakeholders are found in table 4 and an analysis of how these factors are related to the distribution of benefits from the enterprises is presented in the following pages. The analysis is based on the limited observations strict sense, and it should be taken as propositions for further inquiry. Furthermore, some of these factors are interrelated and the equity implication from the interactive effects of group factors may greatly differ from the sum of their individual effects.

**Stakeholder Characteristics**

Equity implications both within and between the business stakeholders due the prevailing positions and characteristics of stakeholders have been discussed in the previous section. Additional characteristics that may have implications are presented below.

**Social structure:** Egalitarian social structure (such as Gurung, Magar
Table 4. Factors Affecting Benefit Distribution Among Business Stakeholders

<table>
<thead>
<tr>
<th>1. Stakeholder characteristics</th>
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<tbody>
<tr>
<td>• Social structure</td>
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<tr>
<td>• Leadership</td>
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<tr>
<td>• Caste and ethnicity</td>
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<tr>
<td>• Education</td>
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<tr>
<td>• Political/ideological homogeneity</td>
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<tr>
<td>• Social values</td>
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<tr>
<td>• Occupational structure</td>
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<tr>
<td>• Awareness on enterprise opportunities</td>
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<tr>
<td>• Entrepreneurship culture</td>
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<td>• Remoteness</td>
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<table>
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<th>2. Market structure</th>
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<tr>
<td>• Vertical as well as horizontal competition</td>
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<tr>
<td>• Research and invention</td>
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<tr>
<td>• Product cycle</td>
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<tr>
<td>• Scale of business</td>
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<td>• Value of products</td>
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<table>
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<tr>
<th>3. Policy and regulatory environment</th>
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<tr>
<td>• Change in resource access regime</td>
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<tr>
<td>• Business access/property right</td>
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<tr>
<td>• Business entry constraints</td>
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<tr>
<td>• Tax and rent seeking</td>
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<td>• Enterprise registration</td>
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<th>4. Business services and infrastructure</th>
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<tr>
<td>Availability</td>
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 lerences have much stronger traditional values than the other stakeholders, who have a wider socio-cultural exposure. Communities in Bajura and Mugu, for example, have a strong feeling for boiling honey before they sell or distribute. This severely degrades the equality of honey and hence cannot be marketed. This and several other such social values in other communities have limited scope of local benefits from the trade of NTFPs.

Community homogeneity: Community members vary in terms of wealth, income, education and beliefs, and the more a community is homogeneous in these parameters, the more they likely to devise

Chapehit FUG in Dhankuta has made arrangement for poorest community members to have equitable access to commercial forest products such as Cardamom and Amriso. In hierarchical community structure, the higher caste dominated leaders generally design and implement systems that maximize their own benefits. More hierarchical social structure with class and caste distinction within a community may limit the access of certain group of people to resources for enterprise activities resulting into the inequality. For example, members of some disadvantaged castes are not allowed to enter certain religion parts of the forest in Bajhang.

Leadership: Our observations throughout Nepal indicate that where local leadership is strong, committed and participatory, the enterprise benefits to disadvantages section of the community are enhanced. Examples could be found in Deudhunga Distillation and Bhitteri forest product processing deprived community members and volunteer tremendous community works to create equitable distribution of benefits.
equitable mechanisms. Nirmal Pokhari FUG of Kaski is a strong case of homogenous group where economic benefits are evenly distributed among the members with a special consideration for the poorer members.

**Entrepreneurship culture:** Local harvesters and village traders generally do not like to invest in improving the quality of business which would provided more return to them, such as buying of quality packing material. This lack of entrepreneurship culture also reduces their profits. Traders downstream make decisions more business basis and hence are in a position to capture better returns.

**Market Structure**

**Information and infrastructure:** Internal and external business stakeholders have different access to marketing information and infrastructure. The marketing infrastructure in rural areas is very poorly developed. The local harvesters and traders do not get reliable market information and lack storage capacity. Usually there are many suppliers with small quantities of products. Access to market intelligence is poor, and it is difficult for the collectors and local traders in Nepal to increase their share of the final selling price, but also reduce the total output generated by the sub-sector as a whole.

**Competition:** There is high competition among local harvesters as well as village traders but the regional market is imperfect. There are only a limited number of regional traders (usually exporters) who also control the price information. Involvement of the government parastatals further aggravated the market structure, which also enjoys the privilege from the state. The high concentration of the trade in regional centers creates an oligopoly situation that is difficult to overcome.

Competition is a positive force that helps balance the market, but the lack of access to information and capital found in the NTFP sub-sector results in inefficiencies, most often to the detriment of poor producers. The high degree of control by the regional traders in the trade could be balanced by increasing the competition for NTFP export. To achieve this goal, airport traders or local marketing groups would have to learn about the export procedures and establish business links with Indian traders. The trade could be legalized and monitored.

Difficulties in matching market requirements by suppliers due to several uncertainties such as production fluctuation, decreased collection due to early snowfall, inconsistent quality of products coming from many sources, etc., are also contributing to the low profit margins of local harvesters and local traders.

Karnali sub-sector study showed that the main risk is created by the high price fluctuations. With a high number of intermediaries, marketing costs are high. Changing weather conditions and the unstable political/security situation in
Karnali also have a negative influence on the capacity to collect and transport the forest products by airplane. This is further aggravated by the limited number of flights between Karnali and Nepalgunj (even worse for passenger flights than for Cargo services).

Changes in product values: Another trend is the traditional collectors and local traders are marginalized when the business becomes more profitable as the value of product goes up. It is generally the poor section of society who collects NTFPs when the price is very low in order to cope with their economic hardship. But other members of society may control the business, as these products become more valuable.

Policy & Regulatory Environment

Considering the existing policy environment (such as the government’s commitment to poverty alleviation, progressive community forestry legislation and the economic importance of NTFPs to the poorest segments of the rural, remote, mountain and hill populations) the goal of the new legislation should be to improve the livelihoods of mountain populations by supporting efficient and sustainable use of these resources. However, the existing acts and regulations are still restrictive in nature. The role of government agencies is perceived to be a controlling authority rather than an agency that enables local environments. A list of regulatory issues and their implications in the distribution of benefits is presented in Table 2, and a brief explanation of key issues is given below.

Complex and restrictive procedures: The present regulation contains a set of complex and restrictive procedures to obtain permits and to extract and utilized forest products. These procedures lack institutional support and the provisions for public goods (such as information, research, technology, infrastructure and finance) to private and community enterprises. Inconsistencies and contradictions found within and between the Forests Act, Regulations, Executive Orders and Circulars also complicate the situation. Consequently, this law is frequently circumvented. Most NTFP trade occurs in the informal sector.

There are no policy goals to facilitate commerce. Product regulations are control oriented. The restrictive regulations are apparently by-passed, generally not enforced, and grant power to the regulating authorities to extract rents (Olsen and Helles 1997; Subedi 1998; Kanel 1999). Under such conditions only the resourceful and influential big traders are able to manage the business tactfully at good profit. In the context of an imperfect regulatory environment and market structure, the more resourceful operating at the market centers and rent-seekers often enjoy benefits at the expense of the resource base, as well as local harvesters and traders that have limited access to information, market and other resource. Local collectors, forest users and village level traders are not getting a fair
share from trade nor is the regulatory environment providing incentives for sustainable harvest. Lack of knowledge on legal provisions, market information and property rights arrangements are making the situation even worse.

**Business entry constraints:** With the increasing trend of globalization, there are many entry constraints for new enterprises. The established big (national or multinational) companies are exerting an influence for creating constraints for few enterprises by imposing stringent requirements. This is more prominent in this sub-sector. For example, a company in Europe may ask to provide the radioactive substance test result before accepting a value added product (such as herbal tea) from Nepal, which is too costly for a Nepalese entrepreneur to afford.

**Table 5. Some Policy and Regulatory Issues and Their Equity Implications**

<table>
<thead>
<tr>
<th>Policy Issues</th>
<th>Equity Implications</th>
</tr>
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<tbody>
<tr>
<td>Arbitrary royalty rates for NTFPs and absence of well-develop system of determining royalty</td>
<td>Increased business costs for internal stakeholders</td>
</tr>
<tr>
<td>Lengthy and costly export formalities</td>
<td>Internal stakeholders excluded from export functions</td>
</tr>
<tr>
<td>Ban on collection and trade of commercially valuable NTFPs that can be harvested on a non-destructive</td>
<td>Destructive harvesting, illegal trade and reduction in share of internal stakeholders</td>
</tr>
<tr>
<td>Contradictions between forest acts and local government acts regarding control over NTFP use and management</td>
<td>Excessive taxes by local as well as central government and increased business costs of internal stakeholders</td>
</tr>
<tr>
<td>FUG rights for NTFPs withheld in forests where DOF has separate agreements with other companies</td>
<td>Reduction in incomes of local communities</td>
</tr>
<tr>
<td>Absence of NTFP management directives and guidelines for community forests</td>
<td>NTFPs controlled centrally and permits given to big contractors, reducing local income</td>
</tr>
<tr>
<td>Inadequate fiscal incentives to community based NTFP enterprise</td>
<td>Business opportunity goes untapped at local level</td>
</tr>
<tr>
<td>Impractical enterprise registration and establishment formalities</td>
<td>Business opportunity goes untapped at local level</td>
</tr>
<tr>
<td>Bureaucratic harassment on commercial use of community forest resources</td>
<td>Lost or reduces income of local communities</td>
</tr>
<tr>
<td>Distorted implementation of regulatory provisions e.g. royalty for NTFPs from private forests and cultivation, mis-identification of species, etc.</td>
<td>Individual cultivators discouraged to grow earn money</td>
</tr>
</tbody>
</table>
Property rights: While the rights and roles of local communities have been recognized for several years through participatory forestry programs such as community forestry in Nepal, emerging business stakeholders are yet to be recognized as legitimate actors creating social benefits. The business in forestry products is considered a second-class activity, and is accessible to people that can mobilize immense political and financial forces. In many areas of Nepal with the community forest in place, access of some traditional local harvesters, especially the poor and disadvantaged, to NTFP collection is reduced or stopped.

An analysis on the effect of ban on distribution of income is presented in the following chart (Fig. 1) using the case of Kutki roots (permitted products) and the Jatamasi rhizomes and roots (banned for export without processing). As Jatamasi and Sugandhawal roots were banned for export in their unprocessed form, and like many illegal products, margins and profit are high. It is very difficult for other traders, especially small ones, to enter this illegal business. The oligopoly position of the small number traders makes price collusion likely. Thus, Nepalgunj traders make the highest profit margins, about 50 percent.

Business Services and Infrastructure

The communities in more remote locations are in worst position in terms of getting benefits from NTFP enterprise activities where availability of business development services is far from reality. The business development services and the type of external support can make a positive contribution in social equity. With the support from ANSAB, local FUGs in Humla enthusiastically developed and implemented a conservation plan once they realized they could generate substantial cash for group funds, as well as the increased cash income of collectors. Some of the policy challengers faced by the FUG turn into prospects with appropriate external support.

With the establishment of a community owned processing company and improvement in marketing system, collectors began to tap the extra income from the NTFPs collected in a planned way. Collectors’ selling price of a commercially valuable plant (Jatamasi) doubled and the collectors’ annual income from NTFPs tripled from Rs 2,665,436 (US$ 39,783) to Rs 10,096,725 (US $ 150,697). The FUGs having forest areas formally handed over to them started receiving fees on the NTFPs collected from their forests. The FUGs of Humla collected a total of Rs 2,187,314 (US $ 32,646) in the period of three years from 1996 to 1998 (Subedi 1999b).

Comparison of profit Margins for Different Operators of Legally and Illegally Exported NTFPs

This mechanism provided equitable returns to local collectors and community groups and hence created incentives for
Figure 1. Comparison of profit margins for different operators of legally and illegally exported NTFPs.

**KUTKI: Example of legally exported NTFP**

- Indian Traders: 15%
- Collectors: 11%
- Village Traders: 19%
- Jumla Airport Traders: 43%
- Nepalgunj Traders: 12%

**JATAMANSI: Example of legally exported NTFP**

- Indian Traders: 16%
- Collectors: 7%
- Village Traders: 3%
- Jumla Airport Traders: 22%
- Nepalgunj Traders: 52%

conserving their resource base. FUGs have been utilizing their fund for strengthening the capacity of their members on resources management, paying watchmen’s salaries in order to protect forest areas from the illegal harvesting, infrastructure of their villages, and other natural resource management activities. Some of the FUGs that have generated funds have been discussing ways and exploring opportunities to make use of the funds (Subedi 1999d).

**Technology**

Nature and application of technology also affect the equity. Although technological requirement for the NTFP enterprise seems straight forward, the bulk of NTFPs are exported, mostly to India, in raw from. As their function is limited to move the products without any value addition, local
harvesters and traders receive only a small portion of the total benefits. Most of the available technologies are not appropriated for increasing the share of benefits to locals. They usually require high level of skills, investment and maintenance, which is not usually affordable to local entrepreneur.

IV. Conclusion

Despite limited public efforts and absence of any outstanding business oriented innovations in promoting the NTFP sub-sector, the unveiling economic values of and consequent business opportunity on a number of products have attracted several business groups. Located at various nodal points of the sub-sector value chain, these groups have drastically different socio-economic characteristics and are bestowed with varying business contexts, which in turn determine their differential access to business development services and opportunities. As a result, they share the money paid by end users in a strikingly inequitable pattern.

The issue of within and between business groups is less appreciated. Internal stakeholders in general, and local harvesters in particular, have not their fair share, local harvesters, who represent poorest members of community, live below the poverty line, are not paid enough. The prevailing marketing structure does not guarantee payment of real value of the product and the costs incurred, not to mention their livelihood needs and the level of efforts they put as stewards of the natural resource base that yields commercial NTFPs.

An analysis of variations in equity scenarios indicate that innovative policy instruments with local, national or international provisions and their effective implementation with the provision for external technical and business inputs could create favorable equity impacts. These factors have interacted with other factors determining equity (as listed in table 4) favorably to influence benefit distribution among the stakeholders. More attention to the factors that can be manipulated may create more favorable equity in the NTFP sub-sector in Nepal.

Acknowledgements: We would like to thank Dr. Madhav Karki for inviting us to prepare the paper for the Regional Workshop. Thanks are also due to ANSAB’ program and field staff who contributed their experience and participated in a one-day in-house equity analysis workshop organized by ANSAB.

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Conservation of Non Timber Forest Products in the Mid-Western Terai Community Forests of Nepal: A Participatory Approach-

Rana B. Rawal

ABSTRACT

The Terai tropical forests are historically the most diverse of Nepal ecosystem, but deforestation has greatly reduced forest area the population of many species and verity of Plant habitats. Over the period of 30 years the Terai was transferred mostly the densely populated region of Nepal. It is interesting to know that, compare to hill system not a single forest area of Terai has been recognized for the traditional management system. Recently, His Majesty’s Government of Nepal is handing over forests to the communities to manage such forests by them under the forest act and by-laws 2051 (1993) which is an appreciable step for the NTFP conservation in the Terai. Communities are becoming more aware of the importance of the NTFPs and biodiversity conservation. Now, it is realized that if the community forests are managed properly, it can provide them many NTFPs such as Sarpagandha (Rauvolifa serpentina), Kurilo (Asparagus recemosus), Pipla (Piper longum), Sikakai (Acacia rugata), Bet (Calamus tenuis), Bidipatta (Diospyros tomentosa), Bael (Aegle marmelos), Amala (Phyllanthus emblica), Barro (Terminalia bellirica), etc. Thus, technically and socially sound operational plans (management plan) of the community forests has to be developed and adapted in order to see the expected results in terms of sustainable forests management. In long run, this leads to conservation of the NTFP resource as well as maintains bio-diversity and provides good economic return to the community.

I. Background

The bio-diversity situation in the Terai ecosystems are global importance both in the view of the number of globally threatened flora and wildlife elements as well as the diversity of ecosystems contained within the area. The Terai area comprises mainly of three board ecological belts; the Churia Hills, Sub-tropical flat lands and Wetlands along the rivers and water-course/bodies. Apart from cultivated area these ecosystems comprise of national parks and its buffer zone areas, community forests, and national forests, which are very rich in bio-diversity. The Terai where the population is in increasing trend by about 3% per year is an important
human habitat and for fauna and flora as well. The obvious contend between human and the wildlife in the Terai resulted the observable deforestation of forest at faster rate which can only be resolved by realizing the economic benefits of the bio-diversity along with sustainable use of subsistence forest products.

This paper focuses on the Terai of Midwestern Development Region of Nepal. Forests hand over to user group in the Terai has recently begun. For instance, in Banke, Bardia districts of Environment and Forestry Enterprise Activity Project (EFEA) the total number of community Forest Users Groups is 113 with 5305 ha. of handed over forests. The total population covered by community forests is only about 15 percent in Banke and 19 percent in Bardia districts. These are far below than those of the four hill districts and one inner Terai (Dang) of Rapti zone, where handed-over forests (EFEA Annual Report 1999/2000) respectively cover about 73 percent and 79 percent of total population. It is important to note that in Terai forests that are handed over to community were close to the high-fuel and timber demands of urban and suburb area, which were already degraded. But, CFUGs have vigilant about protecting and managing these forests as decrease in theft, increasing regeneration of various species that were almost vanished in prior years along with increased crown density is observable.

II. Present Scenario

Population trend and status of the forest:

The eradication of malaria in late 1950s and the completion East-west high way in later years led to widespread settlement in the Terai by migrants from mid-hills. Except within the national parks, the ecosystems in Terai are intensively dominated by human being. Over the period of 30 years, the Terai was transformed into the mostly densely populated region of Nepal. More than 46% of Nepal's population lived in Terai in 1991 and it is expected to exceed by more than 48% in 2006 (MOPE/HMGN 1998). Unsustainable exploitation of the forests to meet the demand for the subsistence products of the increased population caused a large-scale deforestation. Forest area in the Terai plain was reduced by 99,000 ha. in twelve years from 1978/79-1990/91, with an average deforestation rate of 1.3 percent per year (FRISP 1994).

Forest resources and use with respect to NTFPS:

Terai and Siwalik Forests located on the sub-tropical plain forms Nepal's border with India and the row of ecologically sensitive hills that rise from here have not been handed over at the same rate as those in the hills. The Terai forests are still relatively rich in timber, which have often served as the bank account of the socially and politically corrupt elite of Nepal. There are many valuable tree species in the Terai of Nepal. Most importantly species like Sal (Shorea
robusta), Khair (Acacia catechu), Champ (Michelia champaca) that have been more exploited and thus Department of Forest, HMG Nepal has put ban on harvest. Along with these many other species in the Terai forest that are disappearing are for example, Bamboo, Asparagus, and Fern of which shoot are used as additional food (mostly for vegetables). In addition, there are also many NTFP used for different purposes such as medicinal, cosmetics, dyes paints etc. are become rare in the area.

There are many communities such as Tharus and Chepangs who are highly dependent in the different kind of forest products in Nepal. Chepangs live in the forest of Chitwan and Makwanpur for about six months during winter and spring supplementing their foods with forest products (tubers, seeds/fruits and various plant shoots, including animals). Similarly, Tharus in Chitwan area are highly dependent on such kind of forest products. In Terai, besides the timber species people do not see much importance of medicinal plant species/NTFPs that are equally valuable from the point of view of ecological and economic consideration of the region. One of them, for example is Sikakai (Acacia rugata), which could be a good source of cash income to community. Until few years back most of the community thought is as a useless climber affecting the trees growth. Pipala (Piper longum) had similar history. Recently value of these products has been realized and communities have been conserving it for the fruits as the sources of cash incomes. In EFEA area about 50 types of NTFPs have predominantly been collected and sold annually which shows the potential to enhance rural incomes through appropriate intervention in these areas. The value of NTFP sales in EFEA Terai area is about NRs. 27 million (Rs. 25 million in Dang and about one million each in Banke and Bardia)

Opening and program support:

Despite of above facts, no efforts have been made in Terai for management of Non-Timber Forest Products (NTFPs) through for past few years there have been some efforts made for hills with regard to management of medicinal plants species. It is surprising that till now not a single forest area of the Terai has been well recognized for the traditional management system. The Forest Department applied some forest management till 1960s. Many management plants for harvesting and improvement were prepared during later decades but never implemented. It is encouraging that now the Department of Forest is handing over the forests to the users, which is a good step to conserve forest resources in Terai as well. Although a slow progress, so far now 157.079 ha (55% of POCF) of forest are handed over to Terai communities. The “Community Forestry Program” in Nepal is thematically progressive and an approach to conserve the forests through people’s participation. The Forest Act of 1993 and the by-laws provide the legal basis for community
forests development that secure user’s right to manage and harvest resources. Nepal has recognized community forestry as a major dual strategy to improve the condition of the forests and fulfill the rural population’s basic needs for the resources found in them (HMGN 1998). Within a short history communities are also becoming more aware of the importance of forests and its biodiversity.

**Issues with regard to CF implementation:**

Some issues need to be taken care for the smooth implementation of community forestry program in Terai. The government is increasingly refusing to consider petitions for Terai community forests to be handed over without sufficient evidence to prove or disprove that the community forests model is indeed a right approach for Terai. The other issue is about the field implementation guideline for areas earmarked for Potential Community Forest (POCF). The forest area designed as POCF in Community Forest Development Directives (CFDD) and Operational Forest Management Plan (OFMP) guideline recently released by the government is not consistent. For example, in Banke and Bardia, the forest area designated for community forest is very small. The area slated for community forest in current OFMP is rather smaller than the POCF area designated in earlier CFDD. Although the Forest Act and by-laws do not forbid the hand over of any area of national forest to appropriate user group, forest areas that are slated as potential community forests in current OFMP has become disconcerting guideline to DFO’s for expediting community forestry program. If designated POCF area (particularly Banke, Bardia and Pyuthan) is very small, then the land use pressure on national forests cannot be reduced through community forestry, as people will still require the goods and services of non-community forest areas. This will remain constant as a function of hectares available for management regardless of hand over rates.

**III. Some case studies in relation to CF management in Terai**

Some of the cases and lessons learned in the Terai during the last four years of work (1996/97 – 1999/2000) by the development program, Ban Udyam – Biodiversity Support Program/New ERA, EFEA are summarized as follows:

**Case 1. Conservation of Natural Species, Pipia (Piper longum)**

Even with a very small intervention, early recognizable income-based conservation approach is workable with communities and that could be an entry point to foster long-term sustainable forest-based economic development.

There has been hand over of the national forest to the community people for community management and use. The latest available statistics shows that 9,061 CFUGs have been formed in last two decades (CFUG program was started in
late seventies). A total of 657,864 hectares of forestland is handed over to 9,061 CFUGs having 1,008,237 beneficiary households. These handed over forests are managed by the users as per the operational plan approved by HMG/N. For the management purpose, cleaning, weeding, pruning and thinning etc. are common practices adopted by the CFUGs. In EFEA-Ban Udyam project area one interesting observation was made e.g. CFUG members used to cut and throw the natural Piper longum plants (vines) during forest cleaning process. The users did not know the plant and did not realize its important use for medicine, food ingredients, and large commercial market. Bio-diversity conservation being one of the objective, the EFEA-Ban Udyam project started awareness program on the use, protection and conservation of this species in CFs (started in Sishwara CF in Bardia district in 1988). After realizing the importance of this natural high value plant, forest users in this particular CF have created a pipla plot of hectare inside a 45-hectare community forest. From this small area, they could harvest 145 kg of pipla fruits worth NRs. 20,000 (local price) = US$ 275. The total value is not as important as the realization of its importance and conservation of wild species.

Case 2.Natural “Rattan” Conservation Utilization in Sati Karnali CF:

This community forest is located at Narayanpur VDC in Kailali district. The forest area is above 298 ha which was handed over to the 685 user households in 1993. Prior to hand over the forests was degraded due to heavy extraction of forest products by local people as the adjoining villages such as Sati, Narayanpur, Dhansinghpur. The local people (traditional users) realized the fact of the degradation and came up with the community approach. They started protecting the forests and as a result the observable regeneration and the growth of rattan sp.(Calamus tenuis) together with other species such as Sissoo, Catechu, Albizia was encouraging to the communities and two rangers (Mr. C. Chaudhary and S. Paudel) working in the area. They all worked together and found out market potentials and prepared the management plan for rattan as an opportunity to initiate conservation of this plant along with associated species.

a. Activity:

- Rattan and its associated natural species and conservation in the 4 blocks (total area of 139 ha.)
- Sissoo plantation and conservation
- Khair, Siris, Ficus, Vetiver, Satiwan, etc.

b. Management:

Conservation, harvesting, market management etc. all are done by community themselves.

c. Product Marketing:

The incomes from this conservation activity have remarkably been increasing
each successive year. The diversity of plants has also been improved in comparison to post few years. The yield of rattan is seen very high (6.5 meter length of a cane is also observed) when it find the support of trees for climbing. The naturally growing along are Bombax, Albizia and Ficus trees. Communities have already learned and realized the important of these species, which is encouraging for conversing diversity. Presently, it is suggested that the community forest operational plan be revised providing adequate information through appropriate inventory of forest resources, and management and market information while considering social and equity aspect in order to meet a long term objective of bio-diversity conservation by user themselves.

Case 3. Small Scale Enterprise Based on Sabai grass (*Eualliaopsis binata*)

Potential of self-organization strength of rural women can be enhanced with awareness program and preliminary technical support for their confidence building.

This grass is found in wild from in the forests of terai and mid-hills. The most important use of this grass is to make ropes for domestic purposes. In the rural areas where that’s houses are predominant, this rope is extensively used in typing roofs, walls, and fencing as well as in making cots and bullocks carts. In the EFEA-Ban Udyam project area this practice is very common, particularly with Tharu (an indigenous ethnic and disadvantaged group of Nepal) community, which constitutes considerably high proportion of households in the project area, particularly in Dang, Banke and Bardia districts.

The traditional practice of making ropes from the grass is by hand which takes lot of time besides wearing the palm. Realizing this fact, a group of 12 Tharu women is supported by the project to make ropes by a small, manually operated machine, which hardly costs US $ 70. Maintenance of the machine is so simple that the local women do it by themselves. This women group is running this activity as a small-scale enterprise in their village. Following benefits are realized by the community people:

- Gainful utilization of the NTFPs from their community forest (CF)
• Opportunity for employment generation in the form of grass collection, rope making and marketing

• Women empowerment generation, decision-making and marketing

• Time saving for other domestic work and workers' palms are saved from being worn

• Better quality of rope obtained as compared hand made

Income generation: On an average 20 kg of rope is produced in a day (one woman working for eight hours). So gross income = 20 kg × Rs. 14/kg = Rs. 280 = US$ 4 approximately. The average cost of production is estimated as Rs. 6.5/kg × 20 kg = Rs. 130 = US$ 2 approx. The amount in monetary value may look negligible but when compared with other available opportunities (wage labor) where one woman can earn Rs. 50-60 only in a day which is less than a dollar. This shows that there is up to one hundred percent more earning this small, locally establish, community oriented and NTFPs based enterprise.

Case 4. Small Scale Enterprise Based on Sal (Shorea robusta) leaves

Communities have potential to organize themselves for managing utilizing their resources, they only need exposure and initial technical supports. There is opportunity for development worker to enrich forest management for economically viable NTFPs (even minor products as Sal leaves) while working with such groups to foster long-term objectives that meet self-defined progress and long-term biodiversity conservation goals.

Nepalese forests of tropical and subtropical belts have high quality Shorea robusta in it. A total of 233,698 hectares of this type of forest handed over to the community as community manages the forests and gets benefits from it. This is obvious that there will be ample amount of Sal leaves in these leaves. There is very high potential for making different types of plants from these leaves. These leaf plates are commonly used by Nepalese people at different occasions such as rituals, marriage party (in rural areas), worship, festivals and by fast food service providers in urban areas. Presently most of these plates come to Nepal from India, at least in the bordering towns. (Kantipur Daily, July 18, 2000 quotes that the leaf plates worth about US$ 25,000 is annually imported to Nepalgunj from India) and in the hills and mountains people make them by hand as per their family need.

Since the raw material for this product is locally available in ample quantity, rural labor is only partially employed and capital requirement is also quite small, its production by manually operated machine was realized as an important intervention. Therefore, the EFEA-Ban Udyam project is supporting a women group in producing and marketing, the manually operated machine made leaf plates for
rural income generation. Various benefits realized by the community people through this small-scale enterprise are:

- Capacity building of the community people in organizing themselves
- Use of their unutilized, locally available nature resources/NTFP
- Help in supporting the safe environment through use of these disposable and degradable plants in place of non-degradable items.
- Women empowerment
- Helping nation in substituting the imports leaf plates
- Employment opportunities in the from of leaves collection, “Lafa” preparation (joining more than one leaves together loosely, to give a particular size) and marketing.

Income Generation: Leaf plates of different shapes and sizes are produced by the manually operated machines as per the market demand produce leaf plants of different shapes and sizes. Presently, three types of plants (small and medium size, used for snacks and big ones used for dinner/lunch) are being made by this women group. On an average, it is estimated that women group id receiving a benefit of approx. 50% over their production cost. Maximum margin of obtained in medium type of plates (Tapari) where net income of higher than average of all three types of plates together.

IV. Promoting income generation through biodiversity conservation

Considering the observable facts given in this paper, a specific implementing strategy need to be in operation for conserving biodiversity while allowing forest users to manage forest for income generation beyond subsistence.

Implementation of Model Operational Plan:

Community forest operational plan (OP) is a requirement for community forest agreement. Generally most of the OP are adequate to meet subsistence needs, but do not provide adequate information/prescription to allow forest users to manage forests for income generation beyond subsistence. This is especially evident in the area of non-timber forest products (NTFPs). Bio-diversity conservation through integration of income generating activities is very important. Thus, OP needs to be guided to include the sustainable harvesting and biological monitoring prescriptions of the forest resources especially NTFPs. The experience of the forest management activities in the past shows that without income objective community participation for conservation of the diversity of the species is minimal. The OP should include the key subsistence products (fuel wood, poles and fodder), NTFPs and also timber management strategies as appropriate. For the successful conservation OP need to address CFUG management capacity as well as provide prescriptions for good
forestry. A community based M&E system needs to be developed as the integral part of the OP implementation in order to address resource's trend and collect information for CFUG members or decision-makers for more sustainable resources management:

• Applied research that supports technology transfer and/or generates information with regard to naturally grown NTFP management, forest-based micro-enterprise development, and related income generating activities needs to be given greater priority.

• Building linkages between community forest and conservation based enterprise development in the Terai.

• Priority needs to be given to those activities which foster linkages between forest user groups and private sector entities that deal with NTFP processing, marketing, seedling production and sales, etc.

The reasons are as follows:

a. Much of the existing and potential community forest area is degraded and /or withhold plant, which means ample opportunity for forestry sector development facilitators to work with communities for improving biodiversity;

b. There are many species with commercialization potential that keeps users interest alive. In addition, there are numerous CFUGs which are active and growing more empowered;

c. Tropical belt forest responses quickly to management, which encourages local people towards conservation activities.

d. The transportation network is relatively better for market accessibility.

V. Conclusion

Community forestry offers an unparalleled opportunity to promote economic self-sufficiency, a greatly improved natural resources base, increased biodiversity value and locally focused democratic processes undertaken in Nepal over the last ten years. However, much remains to be done to assure that initial, and largely successful, models are not weakened.

It is true that the future of the forest sector development largely depends upon the sustainable management of the ecology and economy of the Terai. The rich biological diversity of the Terai has to be managed for the long-term benefits. The facilitation of the technical assistance in identifying the management prescriptions of the forest resources for the improved forest management should be given due consideration for greater and better impact. The progressive approach of the government of Nepal towards shifting the local forest management responsibility to the local communities is an appreciable
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The technical input in terms of identification of diverse forest ecosystem, resources estimation, documentation of socio-economy, as well as local biophysical information is necessary to enhance and conserve biodiversity. The lessons learned and the methodologies generated and documented by the various development organizations need to be built up and used in the community forest management practices for the sustainable economical return considering biodiversity conservation.

Acknowledgements: The author is grateful to IDRC/MAPPA for providing opportunity to attend the Regional Workshop, Pokhara, Nepal.

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Motivating Actions to Sustain the Medicinal Plant Resources of the Indian Sub-continent: Reports of the Medicinal Plant Stakeholders' Meets

Pushp K. Jain

EXECUTIVE SUMMARY

TRAFFIC India has been executing a three-year project "Motivating Actions to Sustain the Medicinal Plant Resource of the Indian Sub-continent". Besides numerous research and field based activities, TRAFFIC India has organized three Meets so far in the project namely Medicinal Plant Stakeholders' Meet (14-15 December 1998), Meet of the Practitioners of ISM for Conservation and Sustainable Use of Medicinal Plants (26 July 1999) and Medicinal Plant Trading Communities' Meet (6-7 December 1999). All these meetings were held at WWF India Secretariat, Lodi Estate, New Delhi.

Medicinal Plant Stakeholders' Meet

The first national-level Medicinal Plant Stakeholders' Meet was organized on 14-15 December 1998 in New Delhi. The participants included representatives of stakeholders like government agencies, research institutions, practitioners, cultivators, traders, industry and NGOs. The chief guest was Dr. Shanta Shastry, Secretary, Department of Indian Systems of Medicine and Homoeopathy (DISM & H). Following important points were made at the Meet:

- Poor availability or non-availability of several medicinal plants to which there is added problem of adulteration.

- The need to enhance the availability of medicinal plants by cultivation. Development of cultivation technology for largely and commonly used plants and particularly for endangered plants. The technology needs to be easily and practically transferable to field.

- Cooperatives for collection, value addition and trade. Medicinal Plants has a three tier cooperative structure comprising of primary cooperative at village level, union at district level and federation at state level. The Cooperatives in Medicinal Plants face problem due to unregulated and often destructive collection of large number of medicinal plants, often at the behest of middlemen, while the industry prefers to buy from the middlemen and does not encourage value addition at the village level or contribute in
conservation. It was suggested that there should be franchise arrangement between cooperatives and industry for value addition and collaboration between industry and government intuitions.

- National Board for Medicinal Plants – One point solution to numerous problems and issues related to the sector.

- Sustainable use and conservation of medicinal plants should be the responsibility of all the stakeholders, more so of industry as their very survival depends on the consistent availability of the resource. There were suggestions of creation of scared groves, gram van and gram vatika compulsory for every village. FRLTH has facilitated the establishment of 50 conservation sites in Karnataka, Kerala and Tamil Nadu.

Three working groups were created at the Meet, namely, Legislation and Regulation; Research and Education; and Trade, Industry and Enterprise.

The Suggestions of the Working Groups

- All CITIES listed Indian plants be included in the schedules of Wildlife Protect Act

- National Policy for Bio-resources in general and medicinal plants in particular

- Strengthening of enforcement

- Faster patenting process.

- Study of shelf life of herbs and medicine and mention of expiry dates on the same

- Survey and documentation of status of medicinal plants species and quantification

- Finding the reliable figures on volumes of trade and consumption

- Agro-technology

- Development of silviculture techniques for sustainable harvest from forest.

- Database on medicinal plant trade

The Practitioners' Meet

The Practitioners' Meet (The role of traditional systems of medicine in sustainable utilization and conservation of medicinal plants) was organized on 26 July 1999 at New Delhi in which practitioners from Ayurved, Unani, Siddha and Tibetan systems of medicine from all over the country participated. Dr. D.N. Tiwari, Member, Planning Commission and Chairman, Medicinal Plant Task Force" of Government of India chaired the meeting.

Vaidya Balendu Prakash Triguna in the theme address suggested that the practitioners should realize their responsibility towards sustainability for the use of drugs and act by mobilizing and motivating the community and the government for cultivation of medicinal plants.

Vaidya Devendra Triguna suggested the emulation of the example set by China,
where the medicinal plant sector is highly
developed due to political will. He felt
bans wouldn't work. He suggested that
the production should be increased by
cultivation.

Dr. D.N. Tiwari informed the meeting
that the National Bio-Resource Board has
already been created and National
Medicinal Plant Board would be notified
in about 3-4 months. Dr. Tiwari felt that
there are numerous medicinal plant rich
pockets in the country which need to be
identified and special management plans
prepared for these sites for
conservation and sustainable utilization.

In the key notes on Ayurved, Siddha,
Unani and Tibetan Systems of Medicine
vis-à-vis Medicinal plant Resources, virtually all the practitioners had similar
views regarding the availability and
quality of medicinal plants and their
conservation. It was felt that about 50
species of medicinal plants are rare while
another 50 species are threatened. Over-
exploitation, non-scientific harvesting
and many other biotic interference in the
wild, non-availability of cultivated
material and increased demand for
medicinal plants all over the world are
some of the reasons for endangerment
of some medicinal plants. This generally
results in production of sub-standard
medicine due to use of sub-standard
material and substitutes.

For conservation of medicinal plants they
recommended for National Policy on
Medicinal Plants, in-situ and ex-situ
conservation, network of medicinal plants
nurseries, gene banks, agro-techniques for
cultivation, export regulation, creation of
Protected Areas for medicinal plants,
public awareness, and creation of National
Board of Medicinal Plants.

Two working groups - I. Ayurved and II.
Unani, Siddha and Tibetan System - were
constituted to deliberate on the "Role of
Practitioners in the Sustainable Utilization
of Medicinal Plants". The finding and
recommendations of the Working Groups
were as follows.

**Working Groups Findings**

- Availability situation alarming and the
  medicinal plants are dwindling as a
  resource
- Non-availability of certain medicinal
  plants is not having impact because
  adulterants and substitute are sold
- Quality of drugs in the market not
  assured and genuineness is always
  suspected.
- Poor implementation of the Drug and
  Cosmetic Act.

**Working Groups Recommendations**

- Certification of raw material source
  and date of collection
- Improve educational standards
- Creation of reference centers/
museums
- Cultivation with community
  participation in the agro-climatic zones
  where they naturally exist or existed.
• Cultivation of medicinal tree species should be the responsibility of the Forest Department

• The communities and NGOs should prioritize cultivation of the identified important species of medicinal plants required by practitioners and industry.

Medicinal Plants Trading Communities' Meet

Medicinal Plants Trading Communities' Meet (Traders, Exporters, Importers, Cooperatives and Cultivators) was organized on 6-7 December 1999 in New Delhi. Eminent Scientist, Prof. S. S. Handa, Director, Regional Research Center, CSIR, Jammu chaired the Meet.

One full day was devoted to presentations by two key participants each, from the above identified trading community groups on 'Opportunities and Problems'.

Opportunities

• Demand (domestic as well as export) for medicinal plants is growing at a fast pace

• Promotion of medicinal plant enterprises has good opportunities for rural employment generation

• There is a global craze for herbal products (e.g. Woodland herbal shoes)

• WHO has identified 42 medicinal plants worldwide (which are essential for modern medicine systems) out of which 19 are from India

• Madhya Pradesh experiment on cooperatisation of medicinal plant trade along with NTFP trade is a promising model

• There is an across the board concern amongst all stakeholders regarding falling standards of quality of medicinal plants currently available in the market

• There is an earnest desire amongst the stakeholders for self-regulation of unfair trade practices for ensuring quality products

Problems

• Lack of quality products

• Lack of practical standards/specifications

• Short supply of key medicinal plants

• Sudden increase in demand results in adulteration

• Lack of standard cultivation techniques

• Lack of education and training of collectors and cultivators

• Problems with government regulations, especially at the field level where the greatest harassment of traders takes place

• Research in government institutions does not reach the field and seldom
Motivating Actions to Sustain the Medicinal Plant Resources of the Indian Sub-continent

keeps pace with the changing market scenario

- Urgent need of a body (university or National Medicinal Plant Board) to oversee actions for development of the medicinal plants sector in the country

- Cooperative set up is adversely affected by excessive government presence, and politics leading to mismanagement and corruption

- Poor regulation by the Forest Department results in collection, transit and trade of banned medicinal plants also.

- Lack of data on availability, collection, demand and supply, etc.

- Destructive harvesting from the wild

- End users not making contribution for conservation

Four working groups, namely, a) traders; b) exporters and importers; c) cultivators and d) cooperatives were created at the Meet. These working groups had deliberated on the theme "Standardisation, modernization and best practices".

Suggested actions for various medicinal plant stakeholders

- Quality service - improved packing, delivery schedules, quality/quantity commitment, etc.

- Willingness for investing in modernization

- Ensure better availability of information about medicinal plant identification, use, cultivation and processing in the from of books, reports and other educational material

- Scientific Laboratories at the major trading centers to test purity of the herbs at the time of purchases

- Training of the medicinal plant cultivators in the best cultivation methods, improved post harvest technology, and scientific and modern methods of storage and other related practices

- Awareness through media and related resources, and use of computer-technology and mass media advertisement

- Specifications of Standards (easy to understand and implement) for raw and semi-processed herbs are required and made popular

- Simple, inexpensive tests needs to be developed

- Regulation to make it obligatory for large and medium traders (excluding small traders) to state as to from where they are procuring their raw material, and its quality and standard

- Simple, transparent certification system needs setting up either in the private or the public domain

- Check on adulteration

- Control on quality
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- Avoid harmful harvesting practices (e.g. destructive harvesting of Amla (Phyllanthus emblica) in Madhya Pradesh state of India)
- Special attention for the conservation of endangered species (mainly Himalayan flora) disregarding short-term profit considerations
- Realistic Government policy regarding collection and trade of medicinal plants
- Coordination between various groups in the medicinal plants sector
- Agro-techniques at reasonable fee
- Crop Insurance
- Awareness regarding Indian Systems of Medicine, medicinal plants, herbs and conservation right from primary education level
- Lack of quality consciousness among traders as well as industry
- Need of well defined standards and specifications

There was much excitement and some participant made pledges in the interest of sustainable use of medicinal plants such as Dabur Research Foundation promised to publish a booklet on "Good practices for Post Harvest Handling of Key Medicinal Plants". Narayan Das Prajapati, Researcher and Cultivator promised to develop cultivation technology and promotion of commercial cultivation of five rare medicinal plant species of the Thar desert. Mr. A.A. Boaz, Conservator of Forest promised to make available the Draft State Policy for Sustainable Use of Medicinal Plants within six months and Indira Kurana, CSE, New Delhi assured to study the Madhya Pradesh model of Cooperative Efforts for medicinal plant conservation and report the same.

Acknowledgement: The author is grateful to Medicinal and Aromatic Plants Program in Asia (MAPPA), International Development research Centre for providing opportunity to attend the Regional Workshop on Medicinal and Aromatic Plants at Pokhara, Nepal.
Conservation and Sustainable Use of Medicinal and Aromatic Plants: IUCN’s Efforts in Nepal

Mohan Siwakoti
Sagendra Tiwari*

**ABSTRACT**

Nepal’s wide altitudinal variations and diverse climatic conditions provide suitable niche for 5,833 species of flowering plants. Out of these, about 700 species are reported as medicinal and aromatic plants (MAPs). Rural communities for their primary health care have used several species of these plants since a long period of time. Collection of MAPs and sale to Terai based traders for export to India is a regular phenomenon of mountain peoples for subsistence. Sustainable conservation of these resources is gradually recognized as highly potential for mountain development. But, majority of these MAPs is under threats due to habitat destruction, unsustainable harvesting, inadequate regulating mechanisms, impracticable royalty rates and poor database. The problem is further exacerbated due to ineffective management practices to the loss of valuable MAPs in general. The paper highlights some of the efforts of IUCN Nepal’s as a catalytic agent to integrate conservation and sustainable use of MAPs by developing a mechanism to link conservation with rural livelihood.

**Background**

Plants are the main sources of medicine on which majority of Nepal’s population rely for health care. According to WHO, 80% of the population of developing countries rely on traditional medicine mostly plant drugs for their primary health care needs (Uniyal et.al 2000). The utilisation of plants as medicine dates back to Vedic period (4500 BC to 1000 BC). In Ayurveda, definite properties of plants based on drugs and their uses have been described which Vaidhyas and Kabiraj's followed. It is believed that the knowledge of Ayurveda was accessed by Nepali Vaidhays as early as about 879 AD when Susruta Samhita Sahotara was hand written by some Nepali physician (IUCN-Nepal 2000).

Nepal is home for all types of agro-bioclimates from tropical to alpine and arctic. Within a territory of not more than

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Nepal claims over 2 percent of the world’s flowering plants. Nepal is 22 times smaller than India and 70 times smaller than China, but the figure of floral ratio is 1:3 with India and 1:5.5 with China (Shrestha, 1998). The country has set aside over 18.8 percent of its territorial surface as protected area system, which include the highest terrestrial ecosystems of the world. The existence of the diverse ecological zones in Nepal has made a suitable niche for 5,833 species of flowering plants. A total of 700 species of medicinal plants has been estimated from the country, of which over 100 species are in trade. In terms of distribution pattern of medicinal plants, 49% is found in the tropical region (below 1000 m), 54% in the sub-tropical region (1000-2000 m), 36% in the temperate region (2000-3000 m), 18% in sub-alpine region (3000-4000 m) and 7% in the alpine (above 4000 m) region (Malla and Shakya 1985). The highland species are widely known for high value products.

Collection of medicinal herbs for export to Indian markets and manufacturing companies is still a fact of life for mountain people. The proper conservation and management of the Medicinal and Aromatic Plants (MAPs) could play a significant role in Nepalese economy which presently contributes about 5 percent in the Gross Domestic Product (GDP) of Nepal. The District Forest Office records show that mountain peasants collected 11,554 tones of medicinal plants during 1996/97 and helped to generate over NRs. 26 million as the government royalty. Sustainable conservation of non-timber forest products (NTFPs) including MAPs is gradually being recognized as highly potential for mountain development. Development interventions geared towards rural societies need to realise that neither the forests are just groups of trees, nor trees are just mass of wood. Since, forests contain a large number of biological species including valuable medicinal plants. Habitat destruction from human encroachment, unsustainable and over-harvesting practices remain as the major threats to medicinal plants in Nepal. Inadequate policy and regulations for access and tenure over the resources in public lands, impractical royalty rate, lack of expertise on MAPs in regulating agencies, poor database and ineffective management practices are further contributing to the depletion and loss of valuable medicinal plants of Nepal.

Nepal being signatory to Convention on Biological Diversity (CBD) and Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), is committed to implement their respective obligations. Nepal has legal provision under Forest Act, 1993 to ban collection, use, sale, distribution, transportation and export of Dactylorhiza hatagirea, Neopicrorhiza scrophulariifolia and Jugland regia. Six species of plants are banned for raw export (Nardostachys grandiflora, Rauvolfia serpentina, Cinnamomum glaucescens, Valeriana jatamansii, Taxus wallichiana and Lichen...
Conservation and Sustainable Use of Medicinal and Aromatic Plants

spp.) and 6 species are banned for felling, transportation and export (Acacia catechu, Shorea robusta, Michelia champaca, Bombax ceiba, Pterocarpus marsupium, Dalbergia latifolia). Since February 2001, ban on Cordyceps sinensis (Yarsa Gumba) is reviewed and permission is provided to harvest and export. The reviewed royalty rate of Cordyceps sinensis is Rs. 20,000 per kg. Shrestha and Joshi (1996) enlisted 108 threatened plants under the IUCN threat categories, of these 47 species are endemic to Nepal. The IUCN Red List (1997) includes 20 species (0.3 of total) from Nepal that are globally threatened.

IUCN 's Approach in Nepal

IUCN made its presence felt as a conservation partner in Nepal in mid-1980s when it assisted His Majesty's Government of Nepal (HMG/N) in preparing the National Conservation Strategy for Nepal. IUCN officially launched the Nepal Country Office on 1995. IUCN Nepal has been working to fulfil the global IUCN mission by developing partnerships with various government line agencies as well as with non-governmental organisations to carry forward its activities to conserve Nepal's natural resources. IUCN provides technical support to generate the scientific knowledge base for the improvement of management and assists to prepare country report on Red Data List, CITES and CBD. It also works for awareness building at grassroots and policy levels. A major focus area of IUCN in Nepal is to develop mechanism to link conservation with rural livelihood.

IUCN Nepal is committed to assist Nepal in conserving natural resources through a process of sustainable development. Its program is driven as per the need of government, non-government members and partners. IUCN Nepal worked jointly with the ministry of Forests and Soil Conservation (HMG/N) to establish and develop a National Biodiversity Unit (NBU) - the country focal point for biodiversity conservation. IUCN has also assisted the HMG/N to preparing a National Register of Medicinal Plants aimed at securing the knowledge base on biological resources. The preparation of the national register provided a means to establish the mechanism for meeting the third objective of CBD i.e. fair and equitable sharing of benefits raising out of the utilisation of genetic resources, including by appropriate access to genetic resources (article 15), taking into account all rights over those resources; appropriate transfer to relevant technologies (article 18 & 19) taking into account all rights over those resources and to technologies and; by appropriate funding.

The National Register of Medicinal Plants is only an initiation towards this direction, it is an authentic source of information for establishing national sovereignty over the medicinal plants on the basis of indigenous knowledge of traditional uses. The Register is a synthesis of knowledge contributed by various experts and stakeholders. A national forum of experts
and stakeholders was formed to identify the issues related to conservation and development of Nepal's medicinal and aromatic plants. After various consultations a consensus was built for the preparation of National Register. The Register describes 150 species out of 700 species of medicinal plants from Nepal. The National Register will be updated accordingly. IUCN believes on sharing knowledge and expanding networks on MAPs at regional and global levels. For instance, IUCN Nepal facilitated a field visit for Sri Lankan IUCN team during 1999 to exchange the experiences on cultivation, production and processing of medicinal plants for sustainable development. Since 2000, IUCN has started working with communities at local level in order to integrate the conservation of medicinal plants with the livelihood of the rural people focusing on women and disadvantaged dependent upon the natural resources.

In order to learn policy-field realities of NTFP conservation, IUCN Nepal initiated a participatory action research project in a NTFP potential area of Doti district. The ground reality of the project area is that NTFP has a significant role in rural economy. However, in absence of alternative options and increasing market demand, a competition exists there for exploitation of these resources. Consequently, the quantity and quality of the resource is rapidly depleting. Owing to market monopoly of some Tarai based traders the actual resource owners or collectors get very little benefit even less than their labour cost. IUCN Nepal is working with the communities of six VDCs of Jorayal Range Post (Chattiwan, Saraswotinagar, Laxminagar, Ghanteshowr, Gadsera and Nirauli) since 2000. The main purpose of this project is to assist local communities and enhance their capacity under an action research approach to learn and gain experiences as to what working modalities could be adopted to establish a community conservation and sustainable use of NTFPs having high potential in the far-western hill districts. The project has been assisting the communities as a facilitator, coordinator and technical supporter. The project has adopted following four strategies/modalities.

- in-situ conservation in government and community managed forests.
- promoting domestication and intensive cultivation of suitable NTFP species in barren communal lands.
- promoting sporadic plantation in gardens.
- demonstrating conservation and sustainable use.

Field test on these modalities has been initiated by organizing NTFPs dependent communities into NTFP user groups. Under the guidance of project, the user groups have been involved for in-situ conservation and cultivation of some high marketable and threatened species in community forests, marginal and wastelands. These species are Acorus.
calamus, Bergenia ciliata, Swertia chirayita, Valeriana jatamansii, Cinnamomum tamala, Sapindus mukorossi, Phyllanthus emblica and Zanthoxylum armatum. The target groups of project are landless poor, disadvantaged and women. For strengthening local capacities, a number of training for cultivation, sustainable harvesting and marketing of medicinal plants and other NTFPs have been conducted. Since most NTFP species take several years before they could be harvested on sustainable basis. It is expected that during coming 5 to 7 years, different issues related to sustainable NTFP promotion would surface up to provide feed back to policy improvement.

It is anticipated that the experience gained through the implementation of this project should form the basis for designing a much bigger community management of NTFP project for Far-Western hill districts. The approach adopted enables IUCN to work with and learn from the rural communities in enhancing their knowledge base, empowering them and building their capacity for conservation of resources and sustainable use subsequently contributing to good governance.

Conclusion

The diverse ecosystems of Nepal harbour numerous species of medicinal plants, which are highly used by rural societies for their healthcare since ever. These are also gradually being recognised as one of the important wild resources for generating off-farm incomes for the people living in far and remote areas. There is a greater potentiality for income generation and poverty reduction through the proper management of the wild resources. Sustainable conservation and uses of the MAPs can address to certain extent the problems of poor, women and disadvantaged groups depending upon the MAPs. However, MAPs are being over-exploited and threatened. The root causes are lack of standardized resources inventory and assessment, conservation guidelines for sustainable harvest and conservation awareness among the stakeholders. IUCN Nepal is working towards playing a catalytic role to integrate conservation and sustainable use of MAPs with the livelihood of the people by developing mechanisms for technically sound management, socially equitable arrangements and legally enabling policy framework in Nepal.

Acknowledgement: The former author acknowledges the invitation from MAPPA to attend The Regional Workshop at Pokhara, Nepal.

References


Specialist Group held at Corbett National Park, India.


Promotion of Medicinal and Aromatic Plants by Small Farmers Through Training and Capacity Building: Experience of HPPCL, Nepal

Dhruv R. Bhattarai
Pradip Maharjan

Introduction

Nepal is a small country, well known for its rich biological diversity. Forest comprises the major component of its natural resources, occupying about 39 percent of the land area and contributing to about 14 percent in the GDP. The country harbors 35 types of forest with 7000 species of flowering plants including some 700 species of medicinal and aromatic plants.

Rural livelihood is mainly based on forest products, and products like honey, mushrooms, fruits, nuts, tuber, and vegetables are regularly collected for subsistence. Wild plant resources are also contributing in the economy of the rural people. Most rural people are engaged in the collection, transportation and marketing of medicinal and aromatic plants (MAPs) and other non-timber forest products (NTFPs) found in various physiographic zones of the country. About 100 species of NTFPs including about 70 species of MAPs are currently in the export trade. About 10 to 15 thousand tons of MAPs are exported every year from the country.

Herbs Production and Processing Company Limited, Nepal

The Herbs Production and Processing Company Limited (HPPCL) was established in 1981 AD under Ministry of Forest and Soil Conservation, His Majesty's Government of Nepal. The developmental mandate and role of this organization has been defined as a facilitator in commercial utilization of medicinal and aromatic plants (MAPs) for sharing equitable benefits among the public and the government sectors. Industrial utilization of MAPs for value added production in the country was initiated only after the inception of this organization. At present, it is the leading producer of cultivated MAPs and exporter of herbal products like essential oil, herbal extracts and raw medicinal herbs in Nepal.

HPPCL: Activities and Achievements

HPPCL has introduced farming, processing and sustainable collection of MAPs in its herbal farms and processing centres, and community and private lands as well involving local farmers and community forest user groups (CFUGs). It has been assisting local communities in
Sharing Local and National Experience in Conservation of Medical and Aromatic Plants in South Asia

establishing sustainable practices for the wild-growing MAPs. Community level training on sustainable collection, cultivation, processing and marketing has been conducted in 25 rural districts of Nepal under the Special Area Development Program of HMG/Nepal.

With the financial assistance of MAPPA/IDRC, HPPCL has successfully trained the FUG members of 11 community forests in Udaipur district. The training program included identification, conservation and sustainable harvesting of MAPs in the wild, nursery raising techniques for selected medicinal and aromatic plants, plantation of medicinal plants in community forests and private land and their subsequent management procedures. Some 15,000 seedlings of plants like Cinnamomum tamala (Tejpat), Sapindus mukorossi (Ritha), Asparagus racemosus (Kurilo), Rauvolfia serpentina (Sarpagandha), etc. have been produced in the community managed nursery and transplanted in the community forests and community lands. One of the most noteworthy achievements of the MAPPA/IDRC project in Udaipur is the establishment of an essential oil distillation facility by one of the MAPPA/IDRC/HPPCL project trained local Community Forest User Group member. The distillation unit is processing Cinnamomum tamala leaves. Major proportion of the produced essential oil is being purchased and assisted in further marketing by HPPCL. Previously, tons of cinnamon leaves used to be exported from the district with nominal income to the collectors.

HPPCL is engaged in the commercial cultivation of important medicinal and aromatic plants like Mentha, Palmarosa, French basil, Citronella, Chamomile and Lemongrass in its cultivation farms situated in 5 districts (viz. Tamagadhi Herbal Farm, Bara district; Belbari Herbal Farm, Morang district; Tarahera Herbal Farm, Sunsari district; Tikapur Herbal Farm, Kailali district and Lamahi Herbal Farm, Dang district). These herbal farms are also assisting local communities in the cultivation of medicinal herbs with the provision of seeds/seedlings, technical assistance and a guarantee of purchasing their produces. The commercial scale cultivation of MAPs like Palmarosa, Citronella, Lemongrass, Mentha, French basil and Tagetes, with the active participation of local farmers as well, has justified these as profitable cash crops. These crops have been recorded to yield an average profit of NRs. 12000 per annum/per hectare to the participating farmers. The company produces essential oils and medicinal plant extracts from both the cultivated and wild sources of raw materials for industrial use and export.

The results obtained from the agro-forestry models with fast growing trees and medicinal plants in selected community forests of Banke and Bardia districts have been encouraging. HPPCL has also initiated the commercial utilization of local MAP resources at the community level by supporting in the establishment of community-based herbal processing units. In addition, supports to cooperatives and private entrepreneur in
Promotion of Medicinal and Aromatic Plants by Small Farmers Through Training and Capacity Building

rural areas for processing locally available MAPs such as *Gaultheria fragrantissima* (Wintergreen), *Nardostachys grandiflora* (Spikenard), *Juniperus recurva* (Juniper) and *Rhododendron anthopogon* are also being carried out. Such activities are currently functional in remote districts like Jumla, Humla, Dolpa and Ramechhap.

The supports provided for the improved collection/cultivation of MAPs and local level value addition/processing has been extended to the community level establishing community-based cooperatives. The result, 10 small-scale essential oil distillation units are currently functional in Dolakha and Ramechhap districts. These cooperatives have been networked with HPPCL for technical and marketing assistance.

**Acknowledgements:** HPPCL is grateful to MAPPA/IDRC for the financial assistance in implementing the "Study on medicinal and aromatic plant resources of Udaipur district, Nepal" project. The authors are also grateful to MAPPA/IDRC for the invitation to present this paper in the Regional Workshop at Pokhara, Nepal.
An Overview of Medicinal and Aromatic Plant Resources in Humla District, Nepal

Prem N. Kandel

Introduction

Humla is one of the most remote districts of Nepal, the nearest road-head lying at about two weeks' trek from the district headquarters at Simikot. It is the second largest district of the country covering an area of 5,655 sq. km. The altitude ranges from about 1300m to 7200m. Thirteen percent of the district is under forest, dominated by the temperate type. Sub-alpine and alpine grasslands cover 23%, cultivated land 1% and 43% of the area belongs to other categories like snow-covered area, rocky area, rivers, etc.

Due to its remoteness and low population density, the district is rich in forests and forest resources. The local inhabitants share about 1.9 ha. of forest per person. Some 2897 households (41%) are currently managing 13165.25 ha (18%) of the forest (4.4 ha/household) as Community Forests (CF). The collection and trade of various forest products, dominated by high-altitude and high-value NTFPs and MAPs, are playing major roles in the local livelihoods.

This paper is based on the author's field experiences in the district. The author served as the District Forest Officer for two-and-a-half years. His stay in the district was accompanied by intensive field observations, interactions with the NTFP collators, traders, processors, District Administration Office personnel, District Development Committee personnel, forestry-sector NGOs, etc. Short duration field visits were also conducted in connection with different aspects of NTFP research, after he was transferred to District Forest Office, Jumla.

Commercial NTFPs and MAPs of Humla district

Based on the last five years' record, some 20 species of NTFPs and MAPs are being harvested in the district for commercial purposes (Table 1). Table 2 shows the trends in royalty collections from NTFPs in different fiscal years in Humla district.

During the fiscal year 1996/1997, 72.057 tons of different NTFPs were collected for commercial purposes from the district. This provided an income of Rs. 2,34,13,000 to the collectors and traders.

During 1999 and 2000, the author conducted a study on Forest Users Group (FUGs), NTFP collectors and traders in
the district to find out the quantitative and economic contributions of the collected NTFPs. The important findings are presented in Table 3.
Community Forestry

Community Forestry Program is in an infant stage in Humla. The handing over of the government forests to the user communities started some six years before and about 40 forest parches have been handed over to the communities for use and management (Table 4). The District Forest Office has handed over the authority to collect revenue from the CFs to the Forest User Group. This has, on the one hand initiated the conservation and sustainable use of their resources while on the other it has become a steady source of income to the Community Forest User Groups, the community-based local organization.

### Table 3. Quantity of NTFPs Collected and Traded from Humla during the fiscal year 1999-2000 (055-056)

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Napali Name</th>
<th>Collected quantity (kg.)</th>
<th>Total quantity (kg.)</th>
<th>Rate/ kg in village</th>
<th>Rs. collector gets</th>
<th>Revenue collection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DFO records</td>
<td>FUGS records</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Katuki</td>
<td>31,652</td>
<td>2,000</td>
<td>33,652</td>
<td>80</td>
<td>26,92,160</td>
</tr>
<tr>
<td>2</td>
<td>Jatamasi</td>
<td>870.33</td>
<td>3,200</td>
<td>4070.38</td>
<td>30</td>
<td>1,22,109.9</td>
</tr>
<tr>
<td>3</td>
<td>Bhojpatra</td>
<td>4,459</td>
<td>-</td>
<td>4,459</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Gucci chau</td>
<td>318</td>
<td>405</td>
<td>723</td>
<td>5,000</td>
<td>36,15,000</td>
</tr>
<tr>
<td>5</td>
<td>Atis</td>
<td>512</td>
<td>175</td>
<td>687</td>
<td>200</td>
<td>1,37,200</td>
</tr>
<tr>
<td>6</td>
<td>Tukiphul</td>
<td>56</td>
<td>-</td>
<td>56</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>Sugandhawal</td>
<td>284.6</td>
<td>200</td>
<td>484.6</td>
<td>40</td>
<td>19,384</td>
</tr>
<tr>
<td>8</td>
<td>Katuko</td>
<td>7,400</td>
<td>500</td>
<td>7,900</td>
<td>70</td>
<td>5,53,000</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>45,551.93</td>
<td>6,480</td>
<td>52,031.98</td>
<td></td>
<td>71,38,853.9</td>
</tr>
</tbody>
</table>

### Table 4. Data on Community Forests in Humla district

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Fiscal years</th>
<th>No. of CF</th>
<th>Area (ha.)</th>
<th>No. of Household</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>053/54</td>
<td>13</td>
<td>2967.15</td>
<td>969</td>
</tr>
<tr>
<td></td>
<td>(1997/98)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>054/55</td>
<td>6</td>
<td>530.63</td>
<td>278</td>
</tr>
<tr>
<td></td>
<td>(1998/99)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>055/56</td>
<td>12</td>
<td>7188.81</td>
<td>794</td>
</tr>
<tr>
<td></td>
<td>(1999/2000)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>056/57</td>
<td>9</td>
<td>2478.68</td>
<td>856</td>
</tr>
<tr>
<td></td>
<td>(2000/2001)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>40</td>
<td>13165.27</td>
<td>2897</td>
</tr>
</tbody>
</table>

**Acknowledgement:** The author is grateful to MAPPA/IDRC for the invitation to present this paper in the Regional Workshop, Pokhara, Nepal.
International Conventions and Non-wood Forest Product Trade: Implications on Conservation of Biodiversity

Padam P. Bhojvaid

ABSTRACT

In today's complex global economic order, international agreements sometimes become the tools of undue advantage for developed nations. The real objective of any particular agreement is defeated due to internal policies and legislation favouring interest of rich nations. Simultaneous existence of WTO (which asserts trade without discrimination) and Regional Economic Groupings (which are just a new face of the MFN clause of the pre-GATT era) highlights such a burning dichotomy.

Non-Wood Forest Products (NWFPs), of which medicinal plants are prominent, are understood to have the potentialities to safeguard bio-diversity conservation, of foreign exchange earnings for developing countries, and of providing IPR and direct pecuniary benefits to indigenous people for equity in economics of these nations involved in NWFP sector. Policy documents such as CBD, WTO and CITES provide the international legal platform over which the individual signatories will build up their own system of NWFPs (or precisely, medicinal plants) management, development, conservation and trade to safeguard their interest.

The direction of trade in NWFPs is from developing to developed nations. The significant destinations are countries of European Union, Germany, USA and Japan. The import policies of these major players are biased and encourage illegal trade. This illegal trade negates the expectations that NWFPs raise for social upliftment of these poor nations and also affect the biodiversity due to unscientific over exploitation of these resources. Therefore, some attention is required on the part of developing nations to examine if these international agreements, de facto, put them on somewhat 'safer plank' while trading with developed nations.

This paper is a critical examination of the national and international trade in NWFP in South Asian Countries and other relevant international agreements reached to date, in the overall context of the developed nations' hegemonic ambitions over their developing counterparts with respect to conservation and development of NWFPs.
Introduction

The unique phyto-geographical and agro-ecological diversity of South Asian Countries endows them with a rich repository of biological resources. Differing life forms, besides their ecological and intrinsic value, represent a considerable socio-economic and monetary asset value as these are actually and potentially important for developments in the fields of food, medicine, textiles, energy, recreation, tourism and more.

Furthermore, the Non-wood forest products (NWFPs) play an important role in the socio-economic life of forest dwellers than the other major forest produce, timber in all these nations. Timber base has a longer gestation period and is subject to government regulation from time to time. Hence, there is a natural revival in these countries, of interest in NWFP, due to the increasing recognition of their immense social, environmental and industrial development possibilities. This has also raised visionary expectations that a more sustainable utilization of NWFPs will contribute to better forest management, more equitable sharing of forest benefits between all concerned stakeholders, and an improved conservation of the forest resources by the rural people, including their participating support to the maintenance of the biological diversity of the forests (Planning Commission 2000).

However, in most countries of South Asia the realization of projected potential from NWFPs has been a dream particularly for the forest dwellers or the ecosystem (natural habitat of NWFP species) people. This has been attributed to various factors such as inappropriate harvesting, processing, marketing and trade practices and poor information management schemes. Furthermore, these nations have signed all main international conventions such as Convention on Biodiversity (CBD) and Trade Related Aspects of Intellectual Property Rights (TRIPR) to ensure conservation and sustainable management of biodiversity. The nations are also members of World Trade Organisation (WTO), which asserts trade without discrimination and Regional Economic Groupings (which are just a new face of the MFN clause of the pre-GATT era).

The purpose of this paper is to analyse the effect of these conventions on conservation and equitable commercialization of these resources, which are a major component of the biodiversity of this region of globe. In the first part of paper the characteristics of NWFP trade in the producer countries and different stakeholders along the value chain in the national and international trade is presented. It is followed by the effect of international conventions on these different stakeholders and their implication on biodiversity conservation and sustainable management of NWFP in these nations.

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Overview of the NWFP trade and enterprise

There is no systematic national level comprehensive study on trade related issues of NWFPs in India, Nepal, Bhutan, Sri Lanka and Pakistan. Many small sample studies, have indicated that approximately 150 NWFPs, including 26 essential oils and a large number of botanicals (ranging between 4,000 to 6,000), enter national and international markets. The trade in NWFPs has been referred to be as exploitative and dominated by unhealthy and unorganized marketing practices. Some salient features of trade in NWFP can be pointed as follows:

- The value of world trade in NWFPs was of the order of US $11 billion in 1995. The trade is expected to grow annually at a rate of 5-10% between 2000-2010.

- Countries of SEA contribute maximum to the world trade of NWFPs. Recently, China has emerged as leader in world trade of NWFP. India, Indonesia, Malaysia, Thailand and Brazil are other major supporters of NWFP to the world market.

- Most NWFP are imported in unprocessed and semi processed form from developed countries to developed nations. This results in creating more jobs and greater value additions opportunities in the importing nations. The import of such finished products to developing nations results in further loss of precious foreign exchange.

- NWFP trade is marked by conspicuous absence of 'Green Certification' of such products as compared to that of timber, which leads to ban on imports and boycotts, by consumers mainly in developed countries. On the contrary extraction of the NWFPs has been argued as a panacea for protection and sustainable management of tropical forests by may exports.

- EC, USA and Japan collectively account for 90% import of world trade in NWFPs. In the importing nations (approximately 45% of NWFPs do not face duty) due to non-availability of these in importing nations. However, honey, maple syrup, palm leaves, rattans, and flour meal of sago face higher custom tariffs to protect internal productions.

- The exporting countries (developing nations) have imposed high custom duties on export and import of NWFP. These are up to 65% in China and between 30-60% in India (ad Valorem). This is obvious as these nations have tendencies for protection for internal market and revenue earning.

- Export tariffs are very common on NWFP commodities in developing countries. However, pressures on ecosystem people due to poverty (as in case of Gum Arabic in Sudan and...
Medicinal plants in hills of Nepal and India) makes these tariffs counter productive and result in cross border smuggling.

- In terms of linkage to raw materials, most economic and enterprise activities are based on raw materials collected by unskilled people from state owned natural forest areas. Despite the efforts of the national governments the commercial cultivation of these species is still in its infancy and contributes very little to over all national and international trade.

- There are no reliable data about the volume of trade in these countries. However, a large number of site-specific studies have indicated that the NWFP contributions to the local and national economy are significantly higher than that of timber and timber products.

- Four different types of trade is prevalent in the developing countries: a) Firstly, the trade is in local or regional markets of commodities consumed in day to day life by the ecosystem people, b) Second category of trade is domestic and is restricted within the nation for consumption in national industries, c) the trade across the political boundaries of other countries of south Asia and d) fourthly the trade with other continents, which may include both the raw material and finished products.

- The volume of secret and informal (illegal) trade is significantly higher than that of organized trade done either through the government sponsored agencies or co-operative societies.

- The product lines range from essential oils, natural fragrances, health foods, cosmetics, herbal cosmetics, spices, gums and resins and Ayurvedic preparations.

- Most of traders make use of simple technologies for drying and grading. The value addition if any happens away from the natural ecosystem of these plants.

- The business activities in raw plants and plant parts are seasonal in the ecosystem, where primary collectors operate during a limited season. The off site business is constant throughout the year, though there are occasional fluctuations due to demand driven international pressures.

- It is believed that the over exploitation of many botanicals of medicinal value is a threat to their existence (though there is an absence of scientific assessment for inventory of resource). Consequently, the national and state governments have put many such species in the RED list based on IUCN criterion. However, imposition of ban has in no way reduced the collection of these plants. On the other hand the fear psychosis amongst the poverty-stricken ecosystem people has
resulted into secrecy of trade, which affects the equitable distribution of usufruct and conservation of plants.

**Resource status and conservation**

The sustainable management and conservation of NWFP requires and a sound knowledge of the resource inventory and the affect of harvesting on the regeneration of these species. Numerous studies have been undertaken in the southeastern Asian countries with main emphasis on identification, habitat types, distribution, phenology, parts used, principal chemical constituents and local uses etc. of such species. Some manuals have also been prepared though in English, which contain information on the aspects mentioned above. Such manuals, however, are of limited use either to the millions of illiterate forest dwellers that are dependent on these plants or to thousand of field forest officials employed to regulate extraction and ensure the protection of resource. Since no comprehensive quantitative inventory recording occurrence and density of medicinal and aromatic plants on a national level has been carried out, it is not possible to monitor the resource and its sustainable management. Therefore, the notion of resource depletion comes from indirect case studies, which are based on oral interviews with collectors of NWFPs (conclusion are drawn by probing changes in walking distances to resource areas for plant collection) rather then actual field studies based on the methods of quantitative ecology. Similarly, where the whole plant or roots and rhizome of perennials are used, the decision of the regulating authorities to enlist such species as threatened is automatic based on the notion that such collection is more damaging to plants than those where collection is done for leaves, stems, seeds, flowers and buds. A common belief about NWFP resource status in all South and East Asian countries is:

- These are open access resources
- Collectors are unaware about the conservation status
- Collectors use destructive harvesting methods
- Resource degradation is due to commercial collection only

Once again such statement, which are based on case studies rather than scientific methods and can be questioned to warrant generalizations to a national level. One of the advocates of CBD is that “the potentially irreversible threat to resource extinction should not result in postponing the required preventing measure even in the absence of full scientific certainty”. Consequently, national authorities in India, Nepal, Pakistan, Bhutan and Sri Lanka have banned collection and harvest of many medicinal plants and restricted the export of such botanicals. However, imposition of bans has become a boon for smugglers and illegal traders as it creates a fear psychosis amongst poor and illiterate ecosystem dwellers.
Business stakeholders analysis in the NWFP trade in SE Asian countries

Numerous actors are involved in the value chain of NWFP trade. These stakeholders can broadly be grouped into two categories depending on whether they are part of ecosystem of NWFPs distribution. Local harvesters, community village level traders, local NWFP cooperatives and local level processors are ecosystem people. While the regional traders, exporters, large-scale processors, manufacturers and retailers are off site stakeholders.

These actors are linked through a value chain, with flow of products (from ecosystem) and the money (originating from large metros and multinationals). The income accrued to these stakeholders along the chain is governed by many socio-economic, ethno-cultural, political, and regulatory forces. Characteristics of ecosystem people are included as this group is directly connected to biodiversity conservation.

The stakeholders living in the communities closest to the areas where NWFPs grow are generally poor, living at or below the poverty line, and heavily dependent on the surrounding natural resources such as forests and pastures for their livelihoods. These people are mostly illiterate and have none or bare minimum access to facilities of housing, public health systems, schools, and are located far away from the public transport system. Their land hoarding are either very small or none. Therefore, the lean period is utilized for collection of botanicals and other NWFP from natural forests, while collecting fuel wood. The shepherds collect the plants while grazing their sheep and cattle. Furthermore, adult men and women and children, mainly of disadvantaged groups are engaged in the collection activities. They meet a significant portion of the household incomes from NWFP collection. This seasonal employment generates about 30-50 % of their total household incomes (that supports 3-6 months' requirement for food, festival expenses and the two basic food items to be purchased salt and cooking oil).

Their main strengths are knowledge about the distribution of resource, its seasonal variations, knowledge of identification and acquaintance with geography. They often walk 2-5 days passing the nights in forests, climbing steep slopes and coping with extreme cold with insufficient clothing. Their weaknesses include poor financial status, inaccessibility to markets, lack of bargaining capacity and lack of understanding of regulatory laws governing extraction and debt traps at the hands of middlemen. The ecosystem collectors face a threat from cultivated supply and synthetic substitutes of botanicals. Several other risks that surround the collectors include chances of accidents (wildlife, calamities), damages and loss (due to decaying, wastage, leakage), risk of sale and price reductions.

Village traders are the second link in the value chain of NWFP trade. This group
has alternative source of income such as land, small merchandise etc. The village traders have some level of formal education, stronger social linkages with downstream traders and have a fairly good exposure to NWFP marketing channels at the national level. The prime economic objective of village traders getting involved in trade is to meet requirements for cloth, children's education, and others. They generally do not invest money of their own, and operate like agents of off site middlemen. They often provide some advance payments and very often obtain products as repayment from collectors. They hire help for drying and grading of products and thus provide some employment to ecosystem people. These are represented by some organized groups of collectors (generally formed through outside interventions), usually registered with intervention of state governments and NGOs. They also represent poorer community groups and their formation has the sole objective to achieve equitable distribution of profit. There are many examples from Nepal, India and Sri Lanka with main business functions including collection, processing and trading. Such groups have, however, met with mixed success and occasionally become proxies for middlemen. This has been attributed to the complicated official procedures, which cause delay in payment to collectors.

Off site people

This group of stakeholder is generally economically well off and/or politically powerful people in the national context of the South Asian Countries. Their enterprise has the main objective of profit for luxury beyond basic needs. Such groups represent educated people with sufficient exposure to the national markets. These entrepreneurs have international links with business houses across the political borders of the countries of their abode and can exercise better political power to safeguard their business stakeholders. Furthermore, this category of wealthy, educated and local elates (political leaders, service holders and businessman) have the ability to work in complex administrative environments with reference to the permit systems and export import policies of these nations. They often have multiple supply linkages either directly with ecosystem collectors and local harvesters or through village traders and road-head traders. They can exercise high political influence land have smooth access to business services/inputs. They often form cartels to safeguard their interests. Their main business functions include packaging and selling out to national exporters, manufacturers and other Asian traders. They may also directly export to countries outside Asia, through agents in Hong Kong and Singapore. With the exception of India, processing and manufacturing is still in its infancy in countries of the south Asia. There are national companies, both public and private like Dabur, Zandu, Vaidyanath and Hamdard in India, HPPCL (products from essential oils), Natural Products Industries (NPI), Gorkha Ayurveda (GA) and Singha Durbar Vaidya Khana (SDVK)
in Nepal are facing internal (management) and external (marketing) challenges. These possess a great scope of providing employment and developing new natural products that can fetch better prices in international markets. Retailers vary from small businesspeople exclusively dealing with herbal medicines and spices to large business houses dealing with finished goods, partly or wholly composed of NWFPs in large cities. Examples include Ayurvedic medicine shops, groceries containing tea, herbal dye bamboo and rattan product retailers, sal leaf plate retailers around temples and marketplaces, and others.

**Analysis of International Conventions**

Statistical information is sorely lacking in respect of NWFP resource base. However, whatever information is available indicates that the general flow of trade in NWFP species is directed mostly from the resource-rich and technology-poor South to the biodiversity-poor and technology-rich North. The total world trade of NWFPs is of the order of US $11 billion in terms of its value, of which U.S.A., Japan and European Community imports about 60%. New market preference in general for natural products has also enhanced the demand of NWFPs in national and international trade. The trend of growth in demand for herbal medicines in the North has led to significant changes in the traditional patterns of medicinal plant harvesting and has placed some species under threat. More and more of the favoured species, because of commercial harvesting, are vanishing from their natural eco-system. A sense of insecurity due to this precarious nature of the planet's ecology on the one hand and a desire to have access to, viewed by many as economic fortune from, the South's abundant genetic resources on the other hand have inspired an initiative for the conservation of global biodiversity. The developing world's biodiversity, instead of being treated as common property of the indigenous communities, has in recent years been recognised as the common heritage of the whole of humankind. In response, an initiation was made by UNEP in the year 1988 that culminated with the adoption of the Convention on Biological Diversity (CBD) in 1992. This convention, in force from 1993 with 168 members including India, is a big leap forward in the fair and equitable sharing of benefits from the use of genetic resources.

One necessary approach to encourage nations to preserve their biodiversity has been through the provision of economic incentives. Some of such incentives must very well go to the ecosystem people. But, as the exemplary collaboration between the INBio of Costa Rica and Merck of USA, a case of advance payment of cost of genetic resource, has shown, the people were not a part of the accord at all. A natural corollary is that the ecosystem people's right to self-determination has got to be recognised before they are prepared to enter into negotiations over access to
their resources. The Convention on Biological Diversity has a provision for equitable sharing of results of research and development and the benefits arising from the commercial utilisation of genetic resources. There is a need to actualise this provision and this calls for a wholesome study of the existing legal mechanism nationally in order to safeguard the rights of the indigenous people.

Another aspect related to conservation and commercialisation of NWFPs is prohibition of patenting of life forms. The provisions made in the Trade Related Aspects of Intellectual Property Rights (TRIPS), an agreement signed by 124 member countries in 1994, though exclude plants and animals other than micro-organisms from patenting, biotechnology products and processes are protected in the broadest possible sense. This raises a potential conflict. While IPR regime covers protection of the rights of innovators, the traditional indigenous knowledge itself cannot be protected. One controversial instance of this is the case of the neem tree. Two US companies got patents for derivatives of the active principle, and the rights of the indigenous people were sidelined and they were never compensated for their traditional knowledge. This conflict needs to be examined if the use of property rights is to become an incentive for conservation of genetic resources in the developing countries.

The trade in NWFPs within national boundaries is highly secretive and unorganized. International trade of course is controlled and regulated by various trade measures. Both the tariff related and the non-tariff-related measures regulate the trade. The developed countries have more tariff regulations over export of the finished goods while more liberal is the policy of import of natural resources coming mostly from the South. The developing countries have such provisions the other way round. Opening of India’s economy, removal of the quantitative restrictions in import and over all globalisation in the trade of agricultural produce has much wider impact on NWFP trade. The complexity of this scenario calls for a close examination of the regulations of WTO as well as the new IPR regime.

The advent of biotechnology and global uniformity of intellectual property standards are issues that need to be taken very seriously as these are likely to impinge on conservation issues in general. Access to tropical genetic resources, if denied, would limit innovation. Unrestricted access would trigger their destruction and extinction. What is required is to look for a mechanism for regulating the access so that the ambitions of the developed and also the developing nations can be achieved simultaneously.

The present scenario has been creating confusion as regards conservation of genetic resource of developing countries. A fear is being raised that the valuable indigenous wealth will be taken away and exploited commercially by the resource
and technology-rich multinational pharmaceutical companies. "UNDP estimates that medicinal plants and microbial from the South contribute at least $3 billion a year to the North's pharmaceutical industry. If developing countries are to become economically strong, they need to capitalise on their unique bio-assets. In order to achieve this, they need to have systems that will provide them benefits from global development and marketing of their medicinal plant resources" (Nair 2000).

Many have estimated the quantum of trade in medicinal plants, though it shows only a fragment of the volume that actually crosses national boundaries. However, India undoubtedly is amongst the most important resource collection centres of genetic resource as well as traditional knowledge. "Such has been the growth over the years that their exist 7843 licensed manufacturers of traditional drugs in India" (Sharma 2000). The practitioners of Indian system of medicines including Ayurveda, Siddha and Unani never tried for documentation or classification of the country's diversified resource of plants and animals, and as such the protection of geographical indications of our products have become too difficult. A question is raised about how to provide protection of patents to the formulations and products, which were developed over a period of hundreds of years. "It remains a fact that hundreds of patents are being taken out on traditional medicines the world over. The difference being that while India continues to debate and discuss the issue, other countries are using scientific explanations for the traditional knowledge and applying for patents. And in the bargain, India is losing control over its existing wealth of knowledge" (Sharma 2000).

The scope of conservation of NWFP species is facing limiting factors in the developing countries, which is closely related to the population growth. "The population of the developing countries has expanded from 1.7 billion to 4.4 Billion people; more than a 150% increase. But this is not to say that more people must necessarily mean fewer species habitats. Many other variables are at work, notably poverty, inefficient agriculture, poor land-use planning, inadequate technology and deficient policy strategies among other significant factors of countries concerned; plus adverse exogenous factors of aid, trade, debt, investment and South/North relationships generally. There are abundant linkages that make the picture far more complex than a simple population/biodiversity equation"(Myers 1995). Obviously, the factors influencing conservation of species diversity are beyond the factor of population dynamics.

Awareness about the intellectual property laws is increasing in India and the Indian industry in private sector has responded positively to the new demands of intellectual property laws taking appropriate steps for protection. "An average growth of 23.4% per year has been
observed during the period (1995-1999) in filing of the number of applications for patent" (IPR Bulletin 2000).

Although trade in medicinal plants from developing countries has increased in past few decades with more drugs developed, little if any benefits accrue to the source countries and the traditional communities. Numerous medicines have been derived from the knowledge of tropical forest people and clearly there will be more in the future. This alone is reason enough for all programmes to be concerned with the conservation, development, and protection of tropical forest regions. One of our primary commitments to maintaining biological diversity in the tropics requires acknowledging the value of indigenous knowledge and the importance of traditional medicine to people throughout the tropics.

It is worthwhile noting that at the international level, no exhaustive plan of control and evaluation of the resources of medicinal plants have yet been proposed. The international pharmaceutical industry in developing countries has started developing interest in medicinal plants. The pharmaceutical industry has come to consider traditional medicine as a source for identification of bioactive agents that can be used in the preparation of synthetic medicine. However, they are not looking for the study of rare plant species; they want to test the most commonly used species. The valuable medicinal plants are those with the longest record of accomplishment in the most locations. Many of the more pharmacologically (commercially) interesting medicinal plant species in use around the world are employed in more than one community, and often in more than one country, for multiple uses. In order to avoid depletion of existing repository of medicinal plants many countries have established departments of traditional pharmacopoeia to implement this policy.

With the growing interest in research in the medicinal plants, policy-makers and stakeholders are beginning to recognise the need for an ethical policy regarding the appropriation and use of indigenous knowledge and resources. Many believe an Intellectual Property Rights system could be the best way to achieve these ends, allowing for appropriate financial compensation for the use of indigenous ethnobotanical knowledge. A greater understanding of indigenous knowledge itself is imperative if any system of rights based upon that knowledge is to compensate the indigenous populations.

The role of property rights and traditional knowledge

For natural genetic resources to be preserved, chiefly among the developing countries, one essential step is through the provision of economic incentives. The case of traditional knowledge of indigenous and local peoples has opened debate on the adequacy and ethics of intellectual property protection. The
debate (particularly the absence of consensus on whether and how to extend intellectual property protection to traditional knowledge) has so far shown that issues of intellectual property protection of traditional knowledge are complex and controversial. This is partly because of differences in conceptual treatment and often lack of clarity of the two concepts of traditional knowledge and intellectual property. It is also because a scanty body of information is available to those responsible for policy and law making at both national and international levels. In addition, these issues are often debated in isolated United Nations, business sector and non-governmental organizations' conferences - each with its distinct sectoral interest and focus in the subject. The WTO regime has not confronted the implications of its TRIPS agreement to the protection and use of traditional knowledge.

The debate on intellectual property regimes oscillate between two extremes: one position that advocates for extension of intellectual property protection to cover traditional knowledge, even including patenting of that knowledge, and another position that promotes the status quo where such knowledge is treated as a public good.

INBio-Merck collaboration

In 1991, Merck, a US company, entered into a bioprospecting agreement with the Costa Rican National Institute of Biodiversity (INBio), a non-profit, semi-public organization. Under the agreement, over a two-year period, Merck received 10,000 plant samples. The samples were supplied with information about their traditional use.

INBio agreed to establish facilities for collection and processing of plants, insects and environmental samples from Costa Rica, to hire and train staff for the purpose and also to provide training in Merck facilities. Merck on its part agreed to provide research funding of $1.0 million in two years and to establish processing laboratory at the University of Costa Rica. Merck also agreed to evaluate the samples for potential activity as health and agricultural compounds. A system was agreed to for identifying products, which could earn royalty.

The agreement has been criticised by a number of public interest NGOs. "In the debate about the protection of traditional knowledge, the implied beneficiaries of this protection are traditional peoples. But the truth of the equation is actually quite clearly spelt out in an industry viewpoint: No patents, no benefits" (Singh 1999). "In legal terms, the scheme is based on and assertion of legal ownership in the natural habitat as 'tangible' property. In addition, it permits the 'property owner' to establish a range of subsidiary legal arrangements, such as providing for contractual rights to carry out prospecting activities in a particular territory. Access to genetic material is therefore controlled both by legal agreement and in practical
terms, through the separation between the party who 'prospects' for material and the party which develops any subsequent product" (Walden 1995). This collaboration is a policy case study, which can be pursued by a developing country.

**WIPO versus the Indigenous People: A Debate**

Leaders of indigenous people's organisations attending a WIPO Roundtable meeting in November 1999 on intellectual property and traditional knowledge have criticised the WIPO approach in attempting to impose an intellectual property rights regime on traditional knowledge. They called on WIPO, governments and other multilateral organisations to explore other ways to protect and promote indigenous and traditional knowledge outside of the traditional IPR regime.

More than a hundred indigenous people's organisations separately issued a statement calling on governments to amend the TRIPS Agreement, Article 27.3 (b), to mandate for ban on the patenting of all life-forms, all naturally occurring processes, and of traditional knowledge related to the use of biological resources. Near the end of the WIPO Roundtable, the Indigenous Peoples' Caucus issued a statement that was orally presented by Victoria Tauli-Corpuz of the Tebtebba Foundation, an international indigenous people's research centre based in Philippines. "It seems that this was primarily organised to reinforce the mandate of WIPO to promote and implement the dominant intellectual property rights regime and to assert that intellectual property rights is the only viable path to protect traditional knowledge," said Tauli-Corpuz.

She said, "Other forms of protection should be explored and developed in partnership with indigenous peoples and other traditional knowledge holders. Any effort to negotiate a multilateral framework to protect indigenous and traditional knowledge should consider indigenous practices and customary laws used to protect and nurture indigenous knowledge in the local, national, and regional levels." Tauli-Corpuz reiterated the call of indigenous peoples all over the world against patenting of life-forms and life-creating processes, referring to the statement of over a hundred indigenous people's groups opposing patenting of life in TRIPS, which she said was consistent with several proposals put forward by developing countries during the WTO preparatory process for Seattle. "We believe there is a serious conflict on the rights and obligations of member-states between the two treaties, particularly between Article 8 (j) of the CBD and Article 27.3 (b) of the TRIPS Agreement," she said.

**Access to NWFP species: The right to people**

Absolute rights to the natural resources located in proximity of a community cannot be granted exclusively to that
community not only because the natural resource is a common property meant for not a limited community, but also that a single community may not be equipped enough to conserve biological diversity. However, communities in developing countries have continued access to their local natural resources as a right "Considering that most centralised governments, specially in countries of the South, have miserably failed to safeguard such access of even to provide viable alternatives, it is difficult to distinguish between the right to survival and the right to local resources"(Singh et al. 2000). No doubt that the state is the ultimate owner of all resources and the ultimate right has to apply to the state, though local communities may be enabled and empowered so that they can act collectively as responsible custodians of the biodiversity that is situated in their geographical proximity. For conservation of the NWFP species, it will be futile to follow a policy of debarring communities from access to the natural resource that they required for their very survival. The policy of restricting their access to the diversity in natural resources has to be rational, and to be taken with utmost care and transparency. The rationale for this policy "must be shared both with independent experts and with the affected communities. They must be given full opportunity to challenge this rationale. (Singh 2000).

Perspectives in conservation

Most of the NWFP species including the medicinal plants are used locally and the information on supply and demand is often insufficient. It is not known whether the plants are abundant, scarce, if under cultivation then whether the technique is proper, gaps in market linkages, and whether they are endangered or threatened. And if so, what conservative measures would be appropriate. Undoubtedly, conservation approach needs considerable policy support. At times samples are collected for screening, ineffective marketing methods are applied, packaging arrangements are poor, and the products have a very limited shelf life. The situation asks for harsh laws against infringements of conservation. "The policy requirement for endangered species is certainly different from wild stocks that are not abundant in supply and of high regenerative potential" (Swanson 1995).

Biodiversity and traditional knowledge: India's experience

India is one of the twelve megabiodiversity countries of the world. With only 2.4 per cent of the land area, India already accounts for 7 per cent to 8 per cent of the recorded species of the world. This number is based on the survey of 65 to 70 per cent of the total geographical area of the country. Over 47,000 species of plants and 81,000 species of animals have been recorded by the Botanical Survey of India and the Zoological Survey of India, respectively. It is anticipated that some of the remaining areas (e.g., Himalayan region, Andamans & Nicobar Islands) may be far richer in biological
diversity than most of the areas already surveyed. India is also one of the twelve primary centres of origin of cultivated plants and is rich in agricultural biodiversity. India is equally rich in traditional and indigenous knowledge, both coded and informal.

In the recent past, there have been several cases of bio-piracy of traditional knowledge from India. First it was the patent on wound-healing properties of haldi (turmeric); now patents have been obtained in other countries on hypoglycemic properties of karela (bitter gourd), brinjal, etc. An important criticism in this context relates to foreigners obtaining patents based on Indian biological materials. There is also the view that the TRIPS Agreement is aiding the exploitation of biodiversity by privatizing biodiversity expressed in life forms and knowledge. The problem of bio-piracy may not be resolved with such revocation actions and domestic biodiversity legislation alone. There is a need to provide appropriate legal and institutional means for recognizing the rights of tribal communities on their traditional knowledge based on biological resources at the international level.

The attention of multi-national pharmaceutical companies is drawing towards indigenous genetic resource of the developing world including India. It has become imperative to safeguard the conservation measures as well as the traditional knowledge related to NWFP species, specially the medicinal plants, of the country.

Conclusions

Discussions in the previous sections indicate that ‘Poverty amidst Plenty’ is the reflectory statement about collectors. The availability of NWFP in ecosystems, from the managerial standpoint is a big opportunity. However, under prevailing socio-economic, regulatory and ecological forces the collectors will continue to suffer at the hands of business houses both national and multinationals. This is further aggravated by absence of an apex institution in the countries of south East Asia, which has a clear mandate of coordination between collectors, governmental and non-governmental organizations and industrial houses. Furthermore, simplification of legal regulatory mechanisms such as a national transit permit, support price for produce and backward and forward linkages, which ensure buy back and speedy payment to collectors is essential for conservation and sustainable management of NWFP in these counties. Moreover, higher financial gains and their ploughing back are a central solution to a triangular barricade of development, sustainability and participation. NWFP sector is an area where producers need to fetch maximum financial benefits with minimum sales. Apart from reducing various costs, a higher price margin for the dwellers is the key for this. Higher prices are not going to be offered by the users of these
provides automatically but a strategic planning is called for.

**Acknowledgements:** The author likes to thank IDRC/MAPPA for the invitation to participate in the Regional Workshop at Pokhara, Nepal.

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Conservation and Commercialization of Medicinal Plants of the Terai Region, Nepal

Rabindra N. Shukla

SUMMARY

Nepal is a small country with wide altitudinal and climatic variations within short distances. Terai is the southernmost belt of plain land stretched along the east-west direction and occupies about 13% of the land of the country. Forests in the Terai region is dominated by Sal (Shorea robusta) with associates like Adina cordifolia, Aegle marmelos, Bombax ceiba, Acacia catechu, Butea monosperma, Careya arborea, Mallotus philippensis, Terminalia bellirica, Terminalia chebula, etc.

Terai region is rich in medicinal and aromatic plant resources. These have been supporting the rural people considerably in their health care services and livelihoods. Although a large number of medicinal plant species in the Terai regions are collected for household or local uses, only a limited number of them have so far been harvested for commercial purposes.

The commercial medicinal plants in the Terai region can be broadly divided into three categories: over harvested, under-harvested and not harvested. Prominent examples of over-harvested medicinal plant species are Alstonia scholaris, Asparagus racemosus, Rauvolfia serpentina, Curculigo orchioides, Ephemeranthera macraei, Piper longum, Tinospora sinensis, etc. In many instances, the extent of exploitation is so sever that many species have become rare in many localities. The second category of medicinal plants is the commercially under-harvested ones despite their fair availability in the wild. Prominent examples of this category are Phyllanthus emblica, Terminalia bellirica, Terminalia chebula, Aegle marmelos, Cassia fistula, etc. The third category includes medicinal plants that are available in the wild in considerable quantities but their commercial harvesting have not so far been notably initiated. Some prominent examples are Butea monosperma, Holarrhena pubescens, Mallotus philippensis, Justicia adhatoda, Tribulus terrestris, Woodfordia fruticosa, etc.

It is highly imperative that a database of medicinal plants available in the Terai region of the country be prepared to facilitate information on their identification, uses and status in the wild.
Sharing Local and National Experience in Conservation of Medical and Aromatic Plants in South Asia

This effort is likely to assist in the conservation of resources as well as provide alternatives to wild medicinal plant-based sustainable economic development in the Terai region.

Acknowledgement: The author is grateful to IDRC/MAPPA for providing opportunity to attend the Regional Workshop, Pokhara, Nepal.
POSTER PRESENTATIONS

IMPROVING THE QUALITY OF TRADITIONAL MEDICINE
**Tengboche High-altitude Herbal Medicine Project: Experiences in the Sagarmatha National Park, Nepal**

Kate Armstrong
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**ABSTRACT**

In recent years it has become apparent that the influx of tourism in the Sagarmatha National Park of Nepal has not only brought increased wealth, but also a gradual extinction of traditional healthcare, namely Tibetan medicine. The natural environment too has begun to suffer. In view of this, the Tengboche Development Project of Tengboche Monastery has initiated a program to strengthen the role of traditional medicine in Khumbu through the opening of a Tibetan clinic in Namche Bazar and the development of a high-altitude medicinal plant propagation center. In the first year of this project we have managed to photograph most of the herbaceous plants found in the park, as well as document their uses in the Tibetan medical system. We have also been successful in the germination and cultivation of select locally available species. This research is a preliminary survey of medicinal plants utilized in the "Tibetan medicine of Khumbu, Nepal, including their identification and medicinal uses as well as effort to develop guidelines for their conservation, cultivation and sustainable use.

Key words: medicinal plants, high altitude, Tibetan medicine, Khumu region, Nepal

**Introduction**

This has been the first year of an on-going project to boost the status of traditional Tibetan Medicine in the Khumbu region of Nepal. The program was begun at the request of the abbot (Rinpoch) of the Tengboche Monastery, who was concerned about the dwindling availability of traditional medicine as well as the demise of the local environment. Our goals have primarily been to supplement local healthcare by re-introducing the amchi (Tibetan doctor) system through the establishment of a traditional Tibetan medical clinic in Namche Bazar and to document and cultivate important locally available medicinal plants for use in herbal formulas at our proposed pharmacy. Within this vein, we are also trying to promote conservation and awareness.

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about medicinal plants and the local ecosystem.

The Tengboche Development Project’s goals are to:

- Make Tibetan medicine available to those in need
- Gather data on the abundance (occurrence, availability, distribution, etc.) of medicinal plants occurring in Sagarmatha National Park
- Gather data from the cultivation of high altitude medicinal plants
- Develop strategies for the sustainable management and conservation of medicinal plants, while supporting appropriate resource use in the traditional practice of Tibetan medicine
- Provide raw plant materials for the fabrication of Tibetan pill formulas, which will be administered in the clinic
- Provide a model which can be replicated in other areas, to promote the cultivation of high altitude medicinal plants

Background

This year, with a limited budget, we were able to set up a small high-altitude nursery (at approximately 4800m altitude) for the propagation of selected species of medicinal plants (namely Podophyllum hexandrum, Neopicrorhiza scrophulariifolia, Bergenia purpurascens, Dactylorhiza hatagirea, Saussurea costus, Inula racemosa, Meconopsis grandis, Salvia hians) via transplantation from root and rhizome. Species were chosen based on their local availability and usefulness. In addition, germination tests were also conducted on available local seeds (Aconitum spp., Podophyllum hexandrum, Salvia hians, Meconopsis horridula, Meconopsis simplicifolia, Meconopsis paniculata, Notholirion macrophyllum, Incarvillea mairei and Anemone rivularis among others) with a high success rate for Aconitum, Salvia, Notholirion and Incarvillea. Most of the plants in the national park were photo-documented and in some cases specimens were collected. We are currently in the process of identifying photographed plant specimens for their ethnobotanical properties.

Next year we plan to expand our cultivation scheme on the Deboche plot with the addition of a greenhouse and more beds, as well as additional species, based on the availability of their seeds. We have also proposed the installation of plots in Namche Bazar and Thame, as well as the construction of a traditional pharmacy. The addition of a pharmacy/medicine processing unit would enable the herbal medicines to be locally produced and distributed rather than bringing them from Chagpori Medical Institute in India.

Challenges and lessons learned

In implementing our cultivation program, the availability of seed has been a limiting factor. Ideally seed would be harvested in the fall from the national park, but not
all plants which are needed for Tibetan pill formulas are found locally. In addition, they are not readily available from other sources without having a seed collection expedition. This perhaps is what will be needed to jump-start the program. Ideally, once the cultivation scheme intensifies, it will be self-sustaining in that the plantation itself will produce enough seed for further sowing and possibly sharing. At that point it might also be possible to select stock with higher active principle content plantation. Thus, this is an area to which more attention should be given.

Germinating certain wild high-altitude seeds can also prove to be a difficult matter, and the conditions and techniques for this process need to be more closely examined and developed. Every plant species has a mechanism for delaying germination until the seed is dispersed. Therefore, any difficulties with germination can be overcome when one knows the delay mechanisms of the species to be germinated. Temperature fluctuation cycles, light, moisture and chemical inhibitors are some of the variables presented. Stem and root cuttings can also raise the efficiency of propagation but this method does not allow for genetic variation of offspring, eventually leading to weakening of the cultivars.

In our first trial year we had some success with a simple technique, "seed bags." The use of thin polyethylene bags and wet heavy strength paper towels provided and excellent micro-lab in which to test germination of the seeds. Other experiments using the same technology have reported success rates of 90% and better while only investing a fraction of the cost, time and space of more traditional seed germination techniques.

This research has the potential to make important contributions to the development of germination/cultivation techniques for valuable, high altitude, undomesticated medicinal plants. Until now, very little conclusive research has been done in this field. Thus, any headway made would provide a germination methodology, which could be duplicated and implemented in similar regions throughout the country for the cultivation of hitherto uncultivated medicinal plants.

On another note, our clinic has been extremely popular and quite successful in its first year with approximately 60-80 visitors per week. However, our cultivation scheme has received very little interest from locals even though it is meant to be a community project. Local disinterest can most likely be attributed to the wealth that tourism has brought to the area. As with most community projects it is generally believed that if they are linked to a cultural establishment such as a monastery, the project should be more successful. In our case this has not necessarily been true. Thus, it can be said that the interest taken in a project depends upon the economic status of the people especially in case of medicinal plants. In
other areas where the local villagers are less economically stable, the cultivation of medicinal plants offers an opportunity to supplement their income.

Another challenge is operating within the boundaries of a national park. Although there are supposed to be rules in place to re-regulate the collection of plants, they are not often strictly enforced. Plants in the Sagarmatha National Park have not yet been threatened by over-harvesting (other than grazing by yak). As previously stated, this is mainly because tourism has proven such a lucrative business that local people have not looked towards medicinal plants for supplemental income as in other parts of the Himalaya. In this sense, tourism has protected medicinal plants. However, now that we will be setting up a pharmacy to produce medicine, a new pressure will be placed on medicinal species within the park. This new challenge and demand for local plants has instigated the development of our plantation scheme. Since in the beginning, demand may out weigh availability, we are faced with the challenge of how to provide raw materials and not deplete the natural environment, making it imperative to put conservation strategies in place before our "solution" creates a problem.

In the next and coming years we hope that both the strengths and obstacles of this initial year can be translated into lessons learned and a technology that can be shared.

**Acknowledgements**: The lead author is grateful to IDRC/MAPPA for providing opportunities to attend the Regional Workshop, Pokhara, Nepal.
Quality Control of Ayurvedic Medicines Produced in Ritigala Area, Sri Lanka

Lakshmi Arambewela
Suraj Perera*
Menuka Arawwawala*
Priyanthi Dissanayake*

ABSTRACT

Plant materials are used all over Sri Lanka as home and traditional remedies, and raw materials for the pharmaceutical industries. Titigala Strict Nature Reserve (SNR) is located in North Central Province of Sri Lanka and is rich in medicinal plant diversity. At present, about 36 herbal drugs are prepared in small quantities by Ritigala Community Based Development and Environmental Management Foundation (RITICOE) for the treatment of villagers living around Titigala SNR.

Quality control of Ayurvedic drugs is difficult as they contain several plant materials. Therefore it is necessary to establish acceptable guidelines for assessing their quality. Efforts have been initiated to standardize the formulation, improve the quality, initiate large scale production and enhance marketing of 6 Ayurvedic medicines being produced by Ritigala Community Based Development and Environmental Management Foundation (RITICOE). TLC profiles were prepared for Cough syrup (2 items), Thalisadi Churnaya (8 items), Navaratne Kalkaya (16 items), Kalukumara oil (35 items), Ashwagandha Arishtaya (19) items and their ingredients. The specifications and parameters for Kessa Peniya, Nawarathna Kalkaya, Thalisadhi Churnaya, Kalukumara Thailaya, Aswaganda Arishtaya have been established and will be compiled into a monograph for each drug.

Introduction

Titigala Strict Nature Reserve (SNR) is located in North Central Province of Sri Lanka and is rich in medicinal plant diversity. Ritigala Community Based Development and Environmental Management Foundation (RITICOE) is an NGO operating in North Central province of Sri Lanka. One of the main objectives of RITICOE is to involve the local community to protect the unique ecosystem of Ritigala SNR, which is well known for its varieties of medicinal plants. About 200 species of medicinal plants have already been documented from the

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area, many of which are endemic to Sri Lanka and a few of them to Ritigala proper.

RITICOE has launched development programs in the villages of Ritigala to educate the children and support the villagers in the cultivation of medicinal plants, preparation of Ayurvedic drugs, minor irrigation tank rehabilitation, promotion of forest gardens, development of micro-enterprises, etc. Plant products are used all over Sri Lanka as home and traditional remedies, and raw materials for the pharmaceutical industries. Quality control of Ayurvedic drugs is difficult as they contain several plant materials and their chemical nature are not well defined. Furthermore, the chemical constituents in plant parts vary with locality, season of harvesting, stage of harvesting, duration and condition of storage, manufacturing processes, etc. Sometimes there are even problems in identifying the raw materials obtained from plant sources.

At present, about 36 herbal drugs are prepared in small quantities by Ritigala Community Based Development and Environmental Management Foundation (RITICOE) for the treatment of villagers living around Titigala SNR. Most of the drug are now prepared in the houses of villagers or at RITICOE resource center under the supervision of an Ayurvedic physician. Most of the drugs are prepared according to traditional Ayurvedic pharmacopoeia while some drugs are prepared according to traditional native recipes. The mode of actions of most of these drugs is not fully known. These poses further difficulties in bioassays, testing for consistency and measurement of bioavailability of the herbal drugs. Therefore, it was felt necessary to lay down some standards for medicinal plants and herbal drugs by establishing acceptable guidelines for assessing their quality.

The present communication is based on the findings of the IDRC-funded project 'Value Added Products from Medicinal Plants for Community Based Rural Development Program' which is being jointly carried out by Industrial Technology Institute (ITI) and Ritigala Community Based Development and Environmental Management Foundation (RITICOE). One of the main objectives of the project is Standardization of formulations, improvement of quality, industrial production and marketing of Ayurvedic medicines produced by RITICOE. The present communication deals with the quality control of 5 Ayurvedic drugs currently produced by RITICOE.

Methodology

Quality control methods for medicinal plant analysis, referred by WHO, has been followed. Ayurvedic physician confirmed the identity of the plant-based raw materials. Photographs and herbarium specimens were prepared together with consultation of relevant literatures for further confirmation of the raw materials.
The drugs and the raw materials were extracted using appropriate solvents and TLC the fingerprint patterns for all drugs and raw materials were recorded. The above-mentioned parameters and fingerprint patterns were kept as standard for each drug to control batch-to-batch variations.

Results

A. Specifications for Kessa Paniya (Cough syrup)

List of raw materials:
1. Coleus amboinicus (S. Kapparawalliya)
2. Zingiber officinale (S. Inguru)
3. Sugar

<table>
<thead>
<tr>
<th>Kessa Paniya</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foaming index</td>
</tr>
<tr>
<td>pH</td>
</tr>
<tr>
<td>Relative density</td>
</tr>
<tr>
<td>Sugar content</td>
</tr>
<tr>
<td>Tannin content</td>
</tr>
<tr>
<td>Chloroform extractable matter</td>
</tr>
<tr>
<td>Volatile oil content</td>
</tr>
</tbody>
</table>

B. Specifications for Thalisadhi Churnaya (Powder)

List of raw materials:
1. Abies webbiana (S. Talishapatra)
2. Piper nigrum (S. Gammiris)
3. Cinnamomum zeylanicum (S. Kurudu)
4. Elettara repens (S. Enasal)
5. Zingiber officinale (S. Inguru)
6. Piper longum (S. Tippili)
7. Cinnamomum camphora (S. Una-Kapuru)
8. Candy

<table>
<thead>
<tr>
<th>Thalisadhi Churnaya</th>
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</thead>
<tbody>
<tr>
<td>Moisture</td>
</tr>
<tr>
<td>Foaming index</td>
</tr>
<tr>
<td>Tannin content</td>
</tr>
<tr>
<td>Water extractable matter</td>
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<tr>
<td>Volatile oil content</td>
</tr>
<tr>
<td>Total ash content</td>
</tr>
<tr>
<td>Acid insoluble ash content</td>
</tr>
<tr>
<td>Water soluble ash content</td>
</tr>
</tbody>
</table>

C. Specifications for Nawarathna Kalkaya

List of raw materials:
1. Trachyspermum roxburghianum (S. Asamodagum)
2. Glycyrrhiza glabra (S. Weimi)
3. Cedrus deodara (S. Devdaru)
4. Eucalyptus caryophylla (S. Karabu)
5. Ferula asaftetida (S. Perunkayam)
6. Nigella sativa (S. Kaluduru)
7. Cuminum cyminum (S. Sududuru)
8. Zingiber officinale (S. Inguru)
9. Piper longum (S. Tippili)
10. Vernonia anthelmintica (S. Sanninayan)
11. Picrorhiza kurrooa (S. Katukarosana)
12. Terminalia bellirica (S.Balu)
13. Terminalia chebula (S. Aralu)
14. Myristica fragrans (S. Vasawasi)
15. Myristica fragrans (S. Sadikka)
16. Bee honey

<table>
<thead>
<tr>
<th>Nawarathna Kalkaya</th>
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<tbody>
<tr>
<td>Moisture content</td>
</tr>
<tr>
<td>Foaming index</td>
</tr>
<tr>
<td>Tannin content</td>
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<tr>
<td>Water extractable matter</td>
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<tr>
<td>Volatile oil content</td>
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<tr>
<td>Total ash content</td>
</tr>
<tr>
<td>Acid insoluble ash content</td>
</tr>
<tr>
<td>Water soluble ash content</td>
</tr>
</tbody>
</table>
D. Specification for Kalukumara Thailiya

List of raw materials:

1. Kudumihiriya
2. Asparagus racemosus
   (S. Hathawariya)
3. Datura metel (S. Aththana)
4. Hemidesmus indicus (S. Iramisu)
5. Ocimum santum (S. Maduruthala)
6. Atalantia mossionis (S. Paburu)
7. Glycosmis pantaphylla (S. Welmi)
8. Vernonia anthelmintica (S. Sanninayan)
9. Atalantia ceylanica (S. Yakinaran)
10. Citrus sinensis (S. Dodan)
11. Alternanthera sessilis (S. Sudu wellangiriya)
12. Kalu wellangiriya
13. Capparis moonii (S. sudu wellangiriya)
14. Crataeva unilocularis (S. Lunu-Warana)
15. Vitex negundo (S. Vela)
16. Calotropis gigantea (S. Wara)
17. Gyandropsis gyanandra (S. Vela)
18. Citrus aurantifolia (S. Dehi)
19. Terminalia chebula (S. Aralu)
20. Terminalia bellerica (S. Bulu)
21. Phyllanthus emblica (S. Nelli)

Dry raw materials

22. Nigella sativa (S. Kaluduru)
23. Cuminum cyminum (S. Sudu – duru)
24. Trachyspermum roxburghianum (S. Asamodagum)
25. Piper longum (S. Tippili)
26. Euginia caryophylla (S. Karabu)
27. Myristica fragrans (S. Vasawasi)
28. Myristica fragrans (S. Sadikka)
29. Zingiber officinale (S. Inguru)
30. Piper nigrum (S. Gammiris)
31. Allium sativum (S. Sudulunu)

Oils

32. Castor oil
33. Sesame oil
34. Neem oil
35. Madhuca oil

Kalukumara Thailiya

<table>
<thead>
<tr>
<th>Specific gravity</th>
<th>00.8934 (at 30°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refractive index</td>
<td>1.4696 (at 30°C)</td>
</tr>
<tr>
<td>Iodine value</td>
<td>51-53</td>
</tr>
</tbody>
</table>

E. Specifications for Ashwagandha Arista

List of raw materials:

1. Withania somnifera (S. Amukkara)
2. Curculigo orchioides (S. Bintal)
3. Rubia manjith (S. Welmadata)
4. Terminalia chebula (S. Aralu)
5. Curcuma domestica (S. Kaha)
6. Coscinium fenestratum (S. Venival)
7. Glycyrrhiza glabra (S. Welmi)
8. Ipomoea mauritiana (S. Kiribadu)
9. Terminalia arjuna (S. Kubuk potu)
10. Cyperus rotundus (S. Kalandura)
11. Operculina turpethum (S. Tirastawalu)
12. Hemidesmus indicus (S. Sudu – Hahun)
13. Hemidesmus indicus (S. Kalu – Iramusu)
14. Santalum album (S. Sudu – Handun)
15. Pterocarpus santalinus (S. Rat-Handun)
16. *Acorus involucrate* (Wadakaha)
17. *Alpinia calcarita* (S. Aratta)
18. *Woodfordia fruticosa* (S. Malitha)
19. *Plumbago indica* (S. Ratnitul)
20. Bee Honey
21. Water

**Ashwagandha Arista**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture Content</td>
<td>61.40%</td>
</tr>
<tr>
<td>PH</td>
<td>3.57 (at the 25.5°C)</td>
</tr>
<tr>
<td>Specific gravity</td>
<td>1.5078</td>
</tr>
<tr>
<td>Alcohol</td>
<td>4.93%</td>
</tr>
<tr>
<td>Sugar content</td>
<td>27.10g sucrose / 100ml</td>
</tr>
<tr>
<td>Total solid content</td>
<td>38.60%</td>
</tr>
</tbody>
</table>

These Quality control studies of herbal drugs is expected to facilitate safe and effective healthcare system, sustainable use of natural resource and conservation and management of wild medicinal plants.

**Acknowledgement:** The financial assistance provided by Medicinal and Aromatic Program in Asia (MAPPA), International Development Research Centre (IDRC) for this project is gratefully acknowledged.
Sustainability of Traditional Herbal Medicines Practiced in Andhra Pradesh, India

S. Vedavathy

Background

Nearly 80% of the world population is dependent upon traditional medicines for primary health care. Some of the practices of local and indigenous peoples have remained unmodified and kept secret over long periods of time. In the face of industrialization and modernization the indigenous knowledge base has begun to erode. Plants which once abundant became scarce and their uses forgotten. It was this loss of knowledge that prompted the present study to document the ethno-medico-botanical information at its source and raise awareness and assist in cultivation of medicinal plants in meeting their own needs and for income generation.

Study area and people

The study on traditional health practices of the rural people of Chittoor district, Andhra Pradesh (A.P), began in the year 1994. It was financially supported by the Medicinal and Aromatic Plants Program in Asia (MAPPA), a joint initiative of International Development Research Centre (IDRC), Canada and Ford Foundation. The project area in Chittoor district adjoins Tamilnadu state and is located in the Paini river valley. The Tirumala hills, which surround Tirupati town, are a part of northern tip of the Eastern Ghats, a mountain range with rich biodiversity. The predominant tribal population in the district is Yanadi, Yerukala, Nakkala and the Irula. The Yanadis is endemic tribe of the Chittoor and Nellore district with a population of approximately 267,200. There are about 1500 villages in the district.

The first phase of the project began with the following objectives:

- To collect ethno-medico-botanical information on medicinal plants in Chittoor district
- To register the medicinal uses of plants used by the villagers, particularly: (a) home remedies from women, (b) traditional healers having long experience with herbal medicines and (c) tribal peoples' experienced in ethno-medicine and the collection of wild medicinal plants for subsistence and trade.
- To investigate and record the distribution and growth patterns of
plants, their harvesting seasons and traditional methods of medicinal uses.

- To establish a research centre in Chittoor district to investigate the traditional uses of herbal medicines for justification and refinements, and act as a resource centre for training, networking, and dissemination of research findings.

**Methodology**

Fortunately as the author was in the teaching profession, she could mobilize the support of the students who were mostly from rural localities. Besides, the project staff, an Anthropologist and a trained Taxonomist, she along with student community and with the support of local NGOs surveyed 400 villages that are in the fringe area of the forest. The villages surveyed are remote and devoid of modern health facilities. The survey was unique because the students belonging to the same community went to the village, introduced the author and gathered information. This also facilitated the project staff to conduct research activities with ease during the next visits. During 1994-96 several field visits were made and key informants interviewed to get information on medicinal plants and herbal medicines. In communities where there is no NGO or student, the research team contacted the head of the village/sarpanch/VSS head to host a focus group in order to introduce the project's goals, objectives, and methods and to build rapport between the research team and community members. For the survey the team used either a snowball sampling method or, when necessary, went door to door to identify key respondents.

**Participants' observation**

Participants' observation often played a significant role in the research. The coordinator of the project V. Mrudula was also in the process of completing her doctoral studies in anthropology focusing on the ethnomedical practices of the Yanadi tribe. As a component of her studies, she lived amongst the Yanadi tribal for over 4 months, building rapport and trust amongst several villages that participated in the HFRC project. Her experiences were critical to the development of the phase II proposal. The field assistants and the author also frequently stayed in the villages for a number of days and accompanied the participants to forest areas in order to gauge the availability of each species, to observe the growing conditions and to collect samples of each species.

**Survey results**

**Documentation of herbal therapies:**

The survey documented approximately 500 medicinal plants used in various ailments and one thousand herbal formulations that go into the therapies.

**Publication of the findings**

The book "Tribal Medicine of Chittoor District, A. P. (India)", containing the findings of the survey conducted during
1994-96, has been published. Among the documented information, information on about 200 medicinal plants with their uses has been provided in the book. In addition, a number of publications followed in regional languages.

**Establishment of the Research Centre**

A Research Centre, known as Herbal Folklore Research Centre (HFRC), has developed as a resource centre for training, networking and dissemination of research findings.

**Establishment of medicinal plants garden**

A demonstration garden of medicinal plant has been established with 150 samples of wild and rare medicinal plants collected during the field surveys.

**Establishment of the Herbarium**

A herbarium has been set up at HFRC including plant specimens collected during the field surveys. A preliminary seed bank has also been initiated.

**Conduction of case studies**

30 case studies of the popular therapies of the area were conducted by the HFRC in Chittoor district. The objective of the case studies was to document details on traditional treatment methods through interviews with the patients and by observation of the overall treatment. Staffs of the HFRC were introduced to reputed vaidyas in each village by community leaders, members who had participated in the ethnomedico-botanical survey or by community liaisons participating in other aspects of the project. In each case study both the practitioner and patient were interviewed involving documentation of the case history, diagnosis, treatment and recovery of the patients.

**People’s Clinic Trust**

People’s clinic trust (PCT) is a local NGO that works for the health-related issues of the rural people. In collaboration with this NGO (PCT), HFRC conducted a number of case studies. An Ayurvedic doctor, a general physician and a psychologist, all providing services as consultants to the project monitored results of these case studies. Most of the folk practitioners are from marginalized communities. Many of them are specialized in specific disease or a group of diseases. The majority was not compensated financially for their services but received in kinds as payments and supplement their income as agriculture labour.

**Validation tests**

Conducted safety and efficacy studies on selected folk therapies having anti-fertility properties at Indian Institute of Chemical Technology, Hyderabad. Out of the ten samples, five did not show significant results. Out of the remaining five samples, three samples showed anti-implantation activity and was recommended for further histopathological studies.
Phase II

After the completion of the first phase, the project staff involved in the survey concluded that the knowledge on traditional medicines and home remedies are in the hands of older people in the villages. The younger generation is unaware of this knowledge. The youth depend mainly on the elders in the village who has expertise. The old people are also adamant and do not divulge their knowledge unless they see genuine faith and respect in their medication. As such the knowledge base is slowly going towards extinction. The decline in availability of specific plants primarily due to over-harvesting to meet the increasing demand for trade and lack of access to secondary forest land have forces the people to loose confidence in their own system of medication. This has made the Centre to take afresh, awareness campaigns in selected localities to strengthen the traditional health practices and provide training in cultivation of medicinal and aromatic plants to the women and herbal healers in Chittoor district starting from January 2000. At present, HFRC is working for the combined objectives of improved health infrastructure and the conservation and sustainable use of medicinal plants through a number of activities.

Improved primary health options: Training and awareness raising

It includes raising awareness in traditional and local health systems by distributing Herbal Health Kits (Herbal tooth powders, crack creams, dietary supplements, cough syrups, hair oils, herbal pastes for topical application for various skin ailments, and herbal decoctions for digestive ailments)

Traditional health care system

Training is provided in the diagnosis of common ailments, in identifying disease landmarks and the associated time tested herbal treatments. An Ayurvedic Doctor conducts Training. HFRC is developing a manual of synonyms of diseases in local language and English)

Identification, cultivation and use of medicinal plants

Training is provided on the cultivation, sustainable harvest methods and simple technologies for processing local herbal remedies. The students and trained staff of HFRC hold training in the identification and cultivation of plants at the HFRC demonstration garden at Mukkoti, Chandragiri or in the forestland of participating communities. Materials like seeds and seedlings needed for the cultivation of commonly used medicinal plants are distributed to the local people to cultivate in their farms, community gardens and for plantation in the degraded forest areas.

Demonstration garden, nursery and Herbarium

The demonstration garden serves as an experimental farm for standardizing methods of cultivating and domesticating wild species. The garden has a nursery,
which supplies plant samples to participants for planting in community and kitchen gardens. The nursery includes 40 varieties of medicinal plants used in primary health care with 5000 saplings prepared for free distribution. The samples of the live plants found in the demonstration garden have been included in the herbarium, which is comprised of approximately 450 varieties of medicinal plants used in and around Chittoor district.

**Kitchen gardens**

HFRC began the distribution of plants from the nursery during phase I of IDRC funding. The objective was to encourage individuals and communities to cultivate medicinal plants in kitchen gardens and thereby ensure their access to safe and affordable alternatives for treatment of common ailments. This objective was particularly important in extremely isolated and marginalized communities where no formal health care options existed. To date HFRC has encouraged the propagation of MAPs in kitchen gardens in 20-30 villages.

**Toxicity and validation tests**

The validation of herbal therapies for safety and efficacy are continued with modern scientific methods.

**Biodiversity conservation**

In addition to ex-situ cultivation of medicinal plants in the HFRC demonstration garden, nursery, kitchen gardens and community gardens in participating communities, HFRC is encouraging in-situ conservation activities as well. HFRC has conducted basic studies on the sustainable harvesting of wild medicinal plant stocks and, where possible, the reintroduction of wild species in the forest areas in collaboration with the existing joint forest management programs.

**Plant reintroduction in forest areas**

The HFRC has begun the process of liaison with the leaders of NGO’s, volunteer organizations and village leaders in communities where VSS exists and JFM is underway, in order to encourage them to reintroduce native medicinal plants and trees into the degraded forest areas.

**Conclusion**

Indigenous health practices are confined only to remote villages where there are no communication and transport facilities. The practitioners are using the medicinal plants that are available in and around the vicinity of the villages and the value of other medicinal plants are not being put to use by them as they are not easily available. Hence it is time now to educate the folk healers to know more about the medicinal uses of herbs that are not locally available and the need to conserve them. It would become difficult for a researcher or any organization to bring the traditional healers to a particular place and educate them as they mainly depend on medicinal plants and herbal-based treatments for their livelihood. It is difficult to get things
change overnight, reforms and refinements in the preparation of drug and administration methods suited to modern technology. They may also feel that the dissemination of their traditional knowledge and information may hamper their livelihood. The duration of healing process consumes more time than the administration of allopathic medicines. Allopathic doctors dissuade the patient not to use herbal medicine though herbal cure is permanent in most cases. It is necessary to collect the profiles of traditional healers and there by differentiate them from quacks and businessmen.

We can achieve the goal of strengthening the indigenous health practices by regular interaction with different healers assuring them their livelihood and acquiring more knowledge in the healing process that will help them to have a better living. Last but not least it is the sustainability of medicinal plant resource base that plays a vital role in keeping the herbal treatment system alive.

Acknowledgements: The author acknowledges the support provided by IDRC/MAPPA to undertake this research work. The author profusely thanks Dr. Madhav Karki and Ms. Carolyn Switzer for their advice and guidance.
Sustainable Medicinal Plants Conservation in the JFM Areas: A Case from Madhya Pradesh, India

Prodyut Bhattacharya
Bhaskar Mitra*

Background

Lack of disposable income has been the bane of the rural communities as far as one can remember. Most rural development programs have therefore focussed on the generation of income along with resource regeneration as very important components of their programs. The Indian Forest Policy of 1988 and the subsequent resolutions on participatory forest management emphasized the need for people’s participation in natural forest management. The policy documents asserted that local communities should be motivated to identify themselves with the development and protection of the forests, from which they derive benefits. The policy therefore envisages a process of joint management of forests by the state governments and the local people, which would share both responsibilities for managing the resource and the benefits that accrue from this management. But income generation options herein too has been very limited. Under Joint Forest Management (JFM) village communities have been entrusted with the protection and the management of forest and forest products without any clear-cut action plan for their economic improvement. And, in most cases it has been found time and again that the two core issues of resource and income enhancement are inter-related, and that focussing on the former without involving the latter often produces inappropriate results.

In the past few decades, the demand of medicinal plants the world over has been growing very rapidly as a result of renewed interests among the urban elite for natural products. But according to WHO, over 80% of the world’s population, or approximately 4.3 billion people, still rely upon such traditional plant-based systems of medicine for primary health care. Marginalised people, who are unable to financially or logistically access formal healthcare systems, are especially dependent on these herbal medicines. Over a million practitioners of the Indian Systems of Medicine, in the oral and codified streams use around 8000 species of plants in preventive and curative

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applications. At the same time, medicinal and aromatic plants have also become critically important in supporting livelihood options for millions of rural people as a source of income. In India alone, it is estimated that collection and processing of medicinal plants contribute to at least 35 million workdays of employment annually to the poor and underemployed workforce, a majority of whom are women, tribal and the very poor (IDRC 2001). Over the years, bio prospecting has led to the increased usage of locally available plant extracts for manufacturing herbal remedies.

About 95% of the medicinal plant requirements of the Indian herbal drug industry are met from the wild medicinal plants. The raw material coming from the wild is almost entirely collected by the tribal and other forest dwelling communities, collection of medicinal plants has remained whose sole means of livelihood. This provides a fair idea about the potential of the medicinal plants in sustaining tribal and village communities, not only health-wise but also economically. These medicinal and other non-wood forest products play a crucial role in the economy of the tribal dominated areas. The poor collectors and producers sell the raw materials to different types of markets ranging from weekly stalls in villages to well established industrial markets in the larger cities and abroad. The system however, is quite disorganized and inequitable in that the collectors mostly work as wage laborers for contractors and agents who work for larger industries. As a result, the collectors, who are the farthest from the market are paid the lowest share of the market price.

That almost 70% of the Indian rural population still depends on the medicinal plant in some way or the other and that all the supply for commercial consumption comes from the natural forests, which is in no way inexhaustible, their future seem to be rather dim. While the demand for medicinal plants is growing, some of them are increasingly being threatened in their natural habitat (Ramprasad and Bhattacharya 2001). Due to the over-exploitation of medicinal plants for commercial purposes, many of them are on the verge of extinction (Pandey and Bisaria 1998). As a precautionary step the Directorate General of Foreign Trade has therefore banned the export of 46 such plants which are on the verge of extinction. In view of the soaring export markets and increased domestic demand coupled with uncertainty and scarcity of raw materials, adulterated materials obtained through traders and government restriction on some species collected from the wild, some of the big pharmaceutical manufacturers have now begun to opt for cultivation. As part of the process, a number of companies in the private sector are engaged in nursery development, generation of planting material and seeds, development of agricultural techniques for cultivation of medicinal plants and also initiating encouraged cultivation of medicinal plants by contracting them to farmers. Studies
Sharing Local and National Experience in Conservation of Medical and Aromatic Plants in South Asia

carried out under the agricultural council have promoted 'isabgol', 'senna', opium, liquorice, 'tulsi', 'mulhatti', periwinkle, 'sarpgandha', etc. for cultivation. Crops like 'sanai', 'aswagandha', lemongrass, palmarosa, 'safed mush', etc. have been found to be particularly suitable to the agro-climatic conditions of Madhya Pradesh (CEDMAP 1998). Cultivation of medicinal plant, both traditional and commercial species, on tribal farmers land and organized harvesting of forest produce would therefore be the best strategy to provide the much-needed boost to the tribal economy (Shukla and Shrivastava 1993, Bhattacharya et al. 2001).

The project area and its forests

The project area consists of seven villages in the Ghoradongri Development Block of Betul district in Central India. Ghoradongri is located almost 200 kms from Bhopal, the state capital of Madhya Pradesh, on the Bhopal-Nagpur railway line. The work was initiated in three villages – Kanhawadi, Arjungondi and Kharagondi but was later expanded to some other villages in the region.

The agriculture in this region is of the dryland agriculture type depending extensively on rain fed irrigation. Therefore, there are limited numbers of crops to choose from when it comes to agricultural practices. A number of interventions in the area of agriculture have been carried out in the region but their impacts have been very limited. Cash crop like soybean grown by farmers in the area has also faced successive years of failure due to weakening in its gene pool. Furthermore, there has been two successive years of drought in the region, which has literally crippled the economy of the region and increased seasonal migrations to the levels existing a decade ago.

Land holding in the region is highly fragmented thus making agriculture an uneconomical proposition. In addition, the soil also has a tendency to form a hard surface pan if not watered frequently. And water has been a persistent problem in the region in the past two years. Many small and marginal farmers have even left their field fallow in the absence of water for irrigation. Only crops like 'kodo' and 'kutki', which are minor millets, are grown by the farmers in the degrading undulating land in the region mitigating their subsistence needs and not their economic needs.

The forests in the region being of the dry deciduous nature is home to a wide variety of medicinal plants like Chlorophytum borivilianum, Gloriosa superba, Costus speciosus, Asparagus racemosus, etc., all of which hold immense market value. This has resulted in the over-harvesting of medicinal plants found in the area, probably to the extent of being endangered in the region. Over-harvesting on one hand has degraded the medicinal plant habitat and on the other affected its regeneration potential. These medicinal plants are collected from the
Sustainable Medicinal Plants Conservation in the JFM Areas

wild by the poor collectors whereby through a channel of middlemen reach their final destination, be it the export market or the herbal drug industries. The collectors who collect medicinal plants for commercial sale also do so on behalf of the tribal medicine men in the region. A number of medicinal plants like 'Kakai', 'Budwarkand', 'Buddikand', 'Bhasmkand', etc. are now almost extinct in this region, because of its overuse by the tribal medicine men.

According to Champion and Seth's forests classification, the forests of the Betul district fall into 4-A Southern Tropical Deciduous Type with presence of two classes viz. C-1 Dry Teak forest and C-2 Dry mixed deciduous forest. From ecological point of view, the forest can be divided into the following types:

1. Moist deciduous teak (with mixed bamboo)
2. Dry deciduous teak (with or without bamboo)
3. Mixed Type: Terminalia tomentosa, Phyllanthes emblica, Terminalia arjuna, Aegle marmelos, Pongamia pinnata, Anogeissus latifolia, Madhuca indica, Ailanthus excelsa, etc.
4. Salai (Boswellia serrata) dominated
5. Bamboo dominated

Forest Protection Committees created under the banner of Joint Forest Management are found in most villages in the region. The Forest Department had created most of these committees way back around 1996-1997, but most of these societies have had very little role to play as far as the conservation of medicinal plants are concerned. Many from these societies have been making a living through the collection and sale of medicinal plants.

There is ample scope and an immediate need for conservation of medicinal plants with a view to improving the socio-economic conditions of the rural poor and offsetting the myriad demands made on these plants in their natural state. The project hypothesized that a tribal population aware of the needs for conservation of medicinal plants would also readily take to its cultivation as alternate means of economic upliftment. With this urgency, IIFM began its work on a project funded by IDRC titled - 'Community based Sustainable Management of Medicinal Plants in Madhya Pradesh', the objectives of which are as follows -

1. Gather information and assess the ecological and socio-economic status of medicinal plants in the project area.
2. Prioritise and select five medicinal plants with high local value and commercial demand for cultivation. Test and develop models for cultivating them in cultivable land.
3. Study the impact of present conservation and harvesting systems on production and biodiversity status of medicinal plants.
4. Collect and analyse information regarding survival, collection, marketing and potential for value added processing of medicinal plants cultivated and collected.

5. Based on the analysis of data, to recommend a holistic model for promoting cultivation of MPs in degraded forests

**Methodology used in the project**

The methodology adopted had been primarily dictated by the information needs of the project, which in turn were dependent on the objectives to be achieved. A mix of participatory and non-participatory methods was used. Data had been collected from both primary and secondary sources. Primary Information has been gathered from villagers (including medicinal practitioners), Forest Department, Panchayat, and an NGO called Society for Rural Upliftment, Betul (SRUB), our local partner working in the area.

Exposure visits to medicinal farms in the nearby area were made for the village youth and women regarding cultivation of medicinal plants. They were also taken on visits to essential oil extraction units to provide exposure in the similar line. Secondary sources of information included data from available literature, Working Plan of the Betul Forest Division, Census Office and the Centre for Entrepreneurship Development Madhya Pradesh (CEDMAP).

The selected farmers were provided training from CEDMAP in Betul only after which cultivation was carried out. Motivational techniques for attitudinal changes have been used extensively for involving the villagers in the cultivation of some commercial medicinal plants as also for adopting sustainable harvesting practices while collecting medicinal plants. Exposure visits to medicinal farms in the nearby areas were made for the village youth and women regarding cultivation of medicinal plants. They were also taken on study tours to commercial medicinal plant cultivation areas and essential oil extraction units to provide interaction with persons experienced in the cultivation of medicinal and aromatic plants and exposure to such small-scale industrial units. Raw materials for cultivation and nursery were procured from places like Bhopal, Betul and as far as places like Pratapgarh in Uttar Pradesh.

The traditional medicine men were given due importance throughout the project period. Such individuals, being respected persons in the region, had a good sway over the communities. Along with them, the most progressive of farmers among the communities was also involved in the various decisions made at the village level while the collectors groups were consulted for framing sustainable harvesting rules. This ensured that the roles and responsibilities of each stakeholder groups were clearly chalked out and assigned after due consultation with the group. Society for Rural Upliftment Betul (SRUB) had been assisting in the day-to-day
project implementation activities at the field level.

Results and discussion

During the process of implementation of the project, several activities were carried out in the last two and half years. The activities carried out under the project are briefly presented along with their impacts in the area. All the activities were carried out with active support and co-operation of the local communities. To ensure a sensitized participation of the communities, they were trained in relevant aspects like cultivation of medicinal plants, sustainable harvesting of medicinal plants etc.

1. Establishment of Demonstration Plot at Kanhawadi and the resulting awareness generation

A demonstration plot was established in the village, where small-scale cultivation of medicinal plants, both local and commercial, was done. The land for the demonstration plot was donated by the herbal practitioners. Mentha, Lemon Grass, ‘Keokand’, ‘Neem’, ‘Suarkand’, ‘Buddikand’, Turmeric, ‘Sanai’, ‘Adrak’, ‘Bach’, ‘Sarpgandha’, ‘Lehsun’, ‘Khus’, ‘Chuchar Gothi’, ‘Jungli Haldi’, ‘Kali Musli’, ‘Bhasmkand’, ‘Sitafal’, etc., were planted in the field. The idea was for the farmers to see for themselves the results of such activities before they could try it on their own cultivable lands. Another purpose served by the demonstration plot was the establishment of a nursery and seed bank.

2. Identification and establishment of forest plot at Arjungondi for monitoring

For monitoring the ecological status of medicinal plants, a patch of the Arjungondi forest as suggested by the villagers of Kanhawadi and Arjungondi was found suitable by the project team. The villagers themselves selected 10 sites for the monitoring plots and they themselves are carrying out Participatory Forest Resource Assessment activity. The Forest Department has also started a seven-year project on medicinal plants in the same patch where the monitoring had been ongoing. A long-term monitoring carried over a temporal span would provide vital information regarding ecological status of important medicinal plants especially the ones that are threatened.

3. Training of apprentices by medicine men

Traditional knowledge is being gradually eroded due to lack of interest among the younger generation among traditional communities. To revive and continue the age-old knowledge system, apprentices were selected by the medicine men for training under themselves through the ancient system of ‘Guru-Shishya Parampara’. They were selected on the basis of their interest, initiative and commitment towards medicinal plant conservation. They were then imparted training on identifying wild medicinal plants, diagnosing diseases and preparation and prescription of medicines. They were also taught
sustainable collection techniques of medicinal plants. More such groups are being trained from amongst the members within the community to widen the human resource base with the similar knowledge. Such knowledgeable individuals would also be efficient caretakers of their healthcare systems in the absence of government run Public Health Centres.

4. Sponsoring apprentices for Training in MAP cultivation organised by CEDMAP

A few village youths were also sponsored by the project to undergo a six week training in ‘Entrepreneurship Development in Medicinal Plants’ held by the Centre for Entrepreneurship Development in Madhya Pradesh (CEDMAP) at Betul. More village youths are being trained by the project on various aspects of the cultivation of medicinal plants. Efforts are being made to encourage other farmers who are not being covered by the project to take up similar training programs that specialize in the cultivation of medicinal plants. This training provided them vital information regarding the cultivation, marketing and value addition options important in enterprise development.

A. Training of collectors group (who are involved in harvesting for commercial purposes and as well as for the medicine men)

Their designated collectors, living in far-flung villages collect the medicinal plants used by the more renowned medicine men, who supply them to the medicine men. Similarly the collector groups for sale in local and regional markets collect medicinal plants of commercial importance. It was consistently observed that such collectors had little regard for the sustainability of the plant during their collection exercises. This was having a negative impact on the regeneration capacities of the species concerned. The collectors were subsequently trained in appropriate collection techniques to ensure the survivability of the plants after the collection of the desired parts. Herbal practitioners were also provided the same information so that they could ensure that their respective collectors groups adhered to the collection norms.

B. Patient profile register

Patient profile registers of patients visiting some of the medicine men is being maintained at the village level. The record so maintained has generated a profile of the patients and diseases being treated by Bhagat Baba. The records have revealed that people come to them from different parts of India. They are treating a wide range of illnesses ranging from cancer to fertility to jaundice and many other common and complex diseases. This register reveals the possible role the Traditional Medicinal Systems can play in mitigating even modern health care needs as people who come to them are the ones that have been spurned by the allopathic system of treatment.
C. Establishment of village level information centres

Two village level information centres have been established in villages Kanhawadi and Kharagondi. These were established for the dissemination of information on the cultivation techniques of medicinal plants. Inquisitive villagers have been coming from far off places with their inquiries on the cultivation of medicinal plants. Youths who have received training in cultivation of medicinal plants have been put in charge of these centres. Villagers interested in medicinal plants now have the opportunity to receive information on its cultivation aspects from their own people. The youths can also provide information on the harvesting and marketing aspects of the commercial medicinal plants. Reference material on cultivation techniques of medicinal plants in local language has been provided at such centres for dissemination. Video shows, photography display, slogan and poster displays were carried out in the area for public awareness related to conservation and sustainable utilisation of medicinal plants.

D. Cultivation of Medicinal and Aromatic Plants in farmers field

A few villagers showed interest in the commercial cultivation of Medicinal and Aromatic plants after the initial motivation period. Of these, four farmers carried out the cultivation of Mentha arvensis, while the rest preferred to wait for the results. Three of the farmers sowed their fields in the last week of January 2000 and the first crop was harvested in the month of June/July, 2000. The returns for the first three farmers have been provided in table 1.

Mentha arvensis had been chosen as it had better market potential. The planting material was made available by the project. Mr. Mukesh Chourasia, a progressive farmer and a medicinal plant trader from Betul, had assured to buy the produce from the farmers. It was felt that mentha, given the circumstances then, had a better chance of succeeding than any other species. And from the point of view of the project, it was important that these early innovators achieved success with their efforts. This would increase their confidence in the project and would also motivate other farmers, who were keen but conservative regarding their initiatives.

Farmers in this region possess large tracts of area, which are largely wastelands or degraded lands, but which can support an annual crop of coarse millet. Such areas are now being targeted for the cultivation of such medicinal plants that are capable of growing in degrading lands. As a part of the program therefore 'Sanai', 'Dedawal' (Mucuna pruriens) and 'Aswagandha' are being introduced. The wastelands that were not capable of supporting anything more than 'Kodo' and 'Kutki' for self-consumption, can be used to grow economically rewarding species if appropriately tapped. A few bottlenecks have however been recently
observed in the cultivation of these two crops. Due to untimely rains in the region, these seeds (primarily of the dry-land variety) that were distributed to the farmers have been observed to rot after germination due to sudden rise in soil moisture levels.

E. Ethnobotanical study

An ethnobotanical survey was carried out among the medicinal plant practitioners using a questionnaire. Information on medicinal plants and their usage for a particular disease was documented, resulting into a storehouse ethnobotanical information. The study revealed that root, barks and tubers are the most common plant-parts that are used as medicines (fig. 1) which also corresponds with the fact that the most common method of collection of medicinal plants is by digging (fig. 2). More importantly, the study revealed that most of the frequently used and important medicinal plants were grown by the medicine men in their kitchen gardens to assure easy availability in times of need.

Table 1: Profile of Returns from Mentha Crops in Kanhawadi village

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of Farmer (sample)</th>
<th>Area under Mentha (in acre)</th>
<th>Oil Produced (litres)</th>
<th>Returns (@ Rs 400)</th>
<th>Comparative returns from wheat (@ 150 Kgs/Hectare) at Rs. 600/- Qtls.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shri Babulal Varkade</td>
<td>.70</td>
<td>14</td>
<td>5600</td>
<td>252/-</td>
</tr>
<tr>
<td>2</td>
<td>Shri Imrat Lal</td>
<td>.50</td>
<td>7</td>
<td>2800</td>
<td>180/-</td>
</tr>
<tr>
<td>3</td>
<td>Shri Ramgopal</td>
<td>.50</td>
<td>6</td>
<td>2400</td>
<td>252/-</td>
</tr>
</tbody>
</table>

Source: Primary data
F. Preparation of household nurseries

The concept of household nurseries is now being propagated amongst the villagers for growing plants like improved varieties of ‘aonla’, mango, ‘achar’ and ‘mahua’. The seeds are being provided by the project. The individuals developing the nurseries have been allowed the freedom to keep them or sell them off at a price. Efforts were being made to develop as many nurseries as possible covering different medicinal, fruit and fodder species. The farmer partners have been encouraged to adopt agroforestry practices to fulfil the subsistence needs from their own lands.

G. Herbarium preparation by tribal youths

Herbarium of all the medicinal plants that are being used by Bhagat Baba as well as those available in the surrounding areas is being prepared, so that their identification would not be a problem in the future and help in conservation efforts as well. The herbarium has also helped in building awareness about medicinal plants within the village as well as the importance of its conservation. Herbarium specimens are deposited in the information centers in the village so that the villagers as well as outsiders can use them. The apprentices along with the SRUB staff have been provided training in herbarium preparation.

H. Networking of herbal practitioners

A network of medicinal plant practitioners residing in 18 villages of the area have been established to provide them with a forum for voicing joint concerns over ecological status of medicinal plants and information sharing over its availability and usage. This has also provided the communities the much-needed say over the use of the resources available in the region especially those having medicinal importance. They have also prepared and shared a list of dos-and-dont’s during the harvesting season of medicinal plants. The herbal practitioners meet regularly to discuss their day-to-day problems. The network, consisting of practitioners who are reputed persons in the region, can
thus hold sway over the community and control the degradation resulting from over-harvesting for meeting the commercial requirements.

I. Plantation work in farmers' land

The farmers carried out plantation work in their land that were degraded and no cultivation was being carried out. In such lands 'aonla' and mango were planted in alternate rows. Those farmers who had developed household nurseries provided the seedlings for the plantation. These plantations had some mortality due to water shortage in the area. To prevent further mortality an experiment is being conducted by using water filled pitchers with a small hole at the bottom dug under the ground for providing moisture to the soil and thereby to the plant roots. A pitcher full of water can provide the growing plant the much-needed moisture through capillary action and by means of the small hole made at its bottom. This technique ensures water availability to the growing plant for a week, depending on the soil moisture levels and relative humidity conditions. This experience, if successful, could fuel further plantation activities which was hitherto not undertaken on account of the dry conditions prevailing in the region. The process of refilling the pitcher is not a big problem.

Conclusion

The results obtained from the project initiatives clearly shows that there is great scope for cultivation of medicinal plants at community level in backward areas.

The project experience also revealed that national and local level variation in market prices cannot be ignored and steps must be taken to ensure that the cultivators are eventually not losers in the process. The Joint Forest Management Committees (JFMCs) or other similar village level institutions could play assist in marketing, thereby enhancing the collective bargaining power of the rural communities.
In this context the project has therefore aimed to attain the twin objectives – that of propagating sustainable harvesting practices on one hand and propagating cultivation of medicinal plants on the other. In doing so, the project has addressed the issue of the rural economy, the demands of the herbal drug industry and above all the continuity of medicinal plants threatened to extinction by man's insatiable greed.

Acknowledgements: This paper is an outcome of the project ‘Community Based Sustainable Management of Medicinal Plants in Madhya Pradesh’, carried out with financial support from Medicinal and Aromatic Plants Program in Asia (MAPPA), International Development Research Centre (IDRC), New Delhi, India.

References


Ethno-biotic Alternatives to Modern Brooding Techniques

Krishna Kaphle

ABSTRACT

Brooding is a vital and complicated part of modern poultry farming. The complications and small error in this period of life in chicks can have detrimental effect in latter stage of growth. The exiting brooding practice is dominated by reckless and excessive use of antibiotics to combat early chick mortality. The birds are genetically engineered to meet high production level and are under stress from the very beginning. Excessive use of antibiotics from the very beginning has resulted in drug resistance and other undesired effects in chicks in their later stage of life. An ethnobiotic approach for the exciting brooding techniques has been attempted. The incorporation of some potent herbs, skim milk powder, lactobacillus organisms and manipulation of chick's belly by mild trickling to enhance peristaltic movement of the intestine and application of antiseptic in the umbilical opening has been tried in commercial farms at farmer's level in different locations of Nepal. The altered brooding techniques have variable results on their independent trails but were superior over their controlled counterparts. The combined efficacy of the three techniques viz. antiseptic application and trickling, skim milk powder and biotic incorporation in the chick feed, administration of holy basil, tea and sugar in the early drinking water was superior over the controlled ones, which comprised of modern technology with the use of antibiotics. The alternative techniques are however less effective in certain areas and needs further verifications. Based on the outcome of the results these techniques can be taken as alternatives to modern approach where fear the drug residues and allergy manifestation in humans by its position on the top of food chain is alarming. The aim of the present study was to highlight the danger and cost of antibiotics used in chicks from the very beginning and identifies the efficacy of herbal products for sustainable poultry farming.

Key words: poultry, brooding, alternative techniques, herbal extracts, ethnobiotic, tulsi.

Introduction

Brooding, in modern poultry technology, indicates proper raising of day old chicks
Ethno-biotic Alternatives to Modern Brooding Techniques

(DOC) to the stage of their self-sustainability. Poultry development in Nepal has faced many up and downs. The existing modern techniques are widespread but are expensive with possible after effects as well. In natural and wild conditions mostly the avian female under the influence of prolactin hormone changes her physiology to meet the chick's requirement of heat and care. The concept however has changed its course to the modern shape where complications overshadow this period. The brooding period is vital event to the chicks as well as its raisers.

The developing poultry industry of Nepal is still following the traditional way of brooding where use of antibiotics and vitamins are considered a necessary beginning. This research is an attempt to stress on the management and alternative techniques of brooding for better results.

Objectives

The study aims at:

- knowing the existing trends in brooding in Nepal,
- recording the field-level results for the alternative approaches, and make the farmer aware of the importance of this period on chick's life,
- exploring the potentiality of medicinal plant resources in line with organic poultry farming.

Methodology

A trip of the eastern, central and southern poultry pockets of Nepal was executed and farmers, dealers and middlemen were interviewed. Several subsequent visits, evaluation of their records and telephone inquiries collected the feed back of the study. The study at Chitwan valley was conducted by personal supervision of several flocks under varied management conditions. The conditions of chicks with emphasis on parameters like early morality, unevenness and weight gain was monitored, and the findings were compiled.

Existing Technology

The country has a developing poultry industry with major hatcheries located at Kathmandu and Chitwan. Chitwan, located in the central part of the country has the most numbers of hatcheries with high capacity output. The chicks are hatched on twice a week basis and dispensed according to the orders received. The dealers are mostly responsible for providing the necessary brooding arrangement of farmers outside Chitwan valley. A small room or part of the farm itself is isolated and prepared as the brooding site after washing and disinfecting. The use of plastic or canvas to surround the area to prevent the loss of heat is considered a must. The litter's depth varies from season to season. On the floor is the rice hulls. The old newspaper and in some cases paper box cover act as a carpet over the litter to prevent the chicks from playing and swallowing rice hulls. The medium and large scale farmers have now opted for gas brooders as the source of heat with
great success, however small farmers still rely on electric bulbs, sawdust furnace (Bhakari) and kerosene heater as the source of heat. Dispensing starts after the farmer obtains his share of ordered chicks and medicines, which he has been routinely using. The medicines used at the brooding period comprised of some electrolyte mixtures, some anti-stress vitamins, antibiotics ranging from Furaldaltone, Enrofloxacain, Cephalexin, Chlortetracycline, Sulpha groups and others. Some farmers provide liver tonics and vitamin B groups and multivitamins along with water sanitizer as early source. The small-scale farmers use maize grits and maize power as the early sources of feed while large-scale framers have now turned to complete ground Layer or Broiler Starter. The small farmers spread the maize grits on the floor or provide bamboo plates (Nanglo) as feed trays. In case of large farmers plastic chick-trays and chick-drinkers are used to serve food and water. Thus the brooding starts with antibiotics, vitamins and electrolytes provided to the chicks on varying doses, and followed by routine vaccinations starting with B1, (F1) on the very first week. The survey of early chick's mortality on different farms at different seasons revealed high mortality on winter. A medium scale farm comprised of one to five thousand chicks while those having more than five thousand chicks are considered large-scale farmers. The disease surveillance round the year leading to early chick mortality from farms around Chitwan valley has been presented in Table 1.

Table 1. Diseases resulting in complications and mortality basic during brooding stage

<table>
<thead>
<tr>
<th>Disease</th>
<th>Percent</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Omphalitis</td>
<td>40</td>
<td>E. coli infections at farms and hatchery level are both responsible for this out break. Improper biosecurities and shed cleaning are predisposing factors.</td>
</tr>
<tr>
<td>2. Aspergillus</td>
<td>10</td>
<td>Mostly during winters, due to damp walls and wet newspaper resulting out of spillage of drinking water.</td>
</tr>
<tr>
<td>3. Mycoplasmosis</td>
<td>6</td>
<td>Mostly due to high E. coli and parental background. It is also as a result of multiage farming practices.</td>
</tr>
<tr>
<td>4. Salmonellosis</td>
<td>8</td>
<td>Only few breeding farmers have regular salmonella monitoring techniques, complicated of by E. coli.</td>
</tr>
<tr>
<td>5. Pasty Vent</td>
<td>10</td>
<td>Dehydration and over heating accompanied by negligence on drinking system and as a consequence of omphalitis.</td>
</tr>
<tr>
<td>6. Lameness</td>
<td>6</td>
<td>Due to disturbance of Ca:P ratio and vit D3 in breeders as well as in chick feed. M. synoviae and reo attack has also precipitated the outcome</td>
</tr>
<tr>
<td>7. Piling</td>
<td>14</td>
<td>Inadequate and non-uniform heat distribution, sudden noise, power failure, etc.</td>
</tr>
<tr>
<td>8. Unspecific</td>
<td>6</td>
<td>Due to toxicity, malnutrition, predators, transport stress, stepping over and other unspecific causes.</td>
</tr>
</tbody>
</table>
Ethno-biotic Alternatives to Modern Brooding Techniques

Regardless of the cause high early chick mortality has been a common routine on all level of farms. The negligence and inadequate precautions of middle level farmers have indicated an average high brooding mortality on their flocks. The small-scale farmers in spite of limited knowledge and technology labor hard to prevent such complications. The large farmers have enough provisions to prevent such moralities. The frequent outbreak of coccidiosis and Infectious Bursal Disease (Gumbaro) are common on flocks with history of early brooding mortality and complications.

Alternative Approaches

Three alternative approaches to the existing brooding techniques have been followed:

Applying antiseptic on the umbilical opening and manipulating the intestine

The idea was derived from the high cases of omphalitis and inadequate care for disinfecting at farm level. It was detected that many chicks did possess long dry thread of umbilicus, which attracted other flock mates. The tendency to pull the thread resulted in omphalitis and other complications.

The oval naval opening also facilitated the entry of E. coli and other pathogens present on the litter. The idea of manipulating the intestine was to hasten the drainage of yolk from the sac into the intestine via the stalk. The vital nutrient content of the yolk sac was found to be drained quickly post manipulation resulting from increased peristalsis. The manipulation is executed by picking up the chicks and movement of index finger as an act of trickling.

The antiseptics commonly used are spirit, povidine iodine and herbal products. The results have been satisfactory in small and medium farms where chick counting and introduction to drinking water by beak dipping is practiced pre release into the brooding area. In few trial farms of Chitwan valley, the incidence of mortality and final body weight was better compared to the controlled ones under this approach.

Precautions

The picking and manipulation may produce stress in the chicks. The concentration of chemical antiseptics should not be strong enough to damage the soft tissue of the chicks. The bird should not have weight feathers and any attractive features for flock mates to initiate picking. It is also advised to cut the umbilical cord by a skilled technician in aseptic conditions.

Replacing antibiotics by skim milk powder and Lactobacillus organisms

Five farms with capacity of 2000 chicks each was selected and normal brooding management were executed for both the controlled and the treated flock. The only manipulation was with the incorporation
of lactobacillus species (Protexim, Lactosacc) and skim milk powder in the feed of trial groups and antibiotics in the controlled ones. The use of electrolytes and vitamins in the drinking water was provided to both the trial and controlled group. The result obtained has mixed response and needs further trial on poorly managed farms as external microorganisms seems to have influenced the flock provided with no antibiotics.

**Use of Holy basil, tea and sugar in the drinking water**

Only few farmers provide boiled water to the day old chicks. Water cultured in the laboratory from randomly sampled poultry farms of Chitwan provided positive results for microorganisms. A number of farmers were encouraged to use the alternative continuously for 3-5 days. The use of boiled water with holy basil (tulsi; Ocimum sanctum) and tea leaves with sugar was provided for 1-5 days. The farmers boiled 5 liter of water together with 15 leaves of tulsi, _ teaspoon each of tealeaf and sugar, and sieved to serve for 1000 chicks. The resultant decoction was then warmed during winter and cooled by adding ice cubes in summer before filling the chick drinkers. The chick was to dip beak into this solution before releasing. This was provided for 1 to 2 hours early in the morning followed by electrolytes, vitamins and other accessories. Positive results were reported from different poultry farms considered.

**Results**

The performance of flocks under different approach compared to the controlled ones has been presented (Table 2). The variation

<table>
<thead>
<tr>
<th>Treatment (Period of days)</th>
<th>Flock size weight (days)</th>
<th>Early mortality</th>
<th>Average final</th>
<th>F.C.R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I  Antiseptic and Trickling</td>
<td>1000</td>
<td>16</td>
<td>2.100 (50)</td>
<td>2.28</td>
</tr>
<tr>
<td>Controlled I</td>
<td>1000</td>
<td>38</td>
<td>1.980 (50)</td>
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<tr>
<td>II Skim Milk Powder and Lactobacillus sp.</td>
<td>1000</td>
<td>24</td>
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<tr>
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<tr>
<td>Tulsi, Tea and Sugar</td>
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<tr>
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<td>1000</td>
<td>37</td>
<td>2.00 (50)</td>
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<tr>
<td>III Combined I + III</td>
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<tr>
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<td>1000</td>
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in management and farm conditions of different trial has provided different FCR and final body weights. Studies on the controlled groups of the same management level have also been executed. The result of all the approaches has been encouraging over their respective controlled flocks under same management and farm conditions. The result of approach one and three combined over its control indicates the benefit of combined approach. Inspiring results has been achieved with the alternative approach over the existing techniques.

Precautions

Incorporation of excess of tea or tulsi leaves may result in a solution bitter enough to be consumed by the chicks, which may result in dehydration. Law-grade tea or excess sugar may sometimes result in diarrhea. The improper sieving may result in choke due to ingestion of tulsi leaves or tea leaf/granules. Too hot water may damage the beak and tongue of the chick, creating psychological fear for water throughout its life.

Acknowledgement: The author proffers his gratitude to MAPPA/IDRC for the invitation to attend the Regional Workshop in Pokhara, Nepal.
Medicinal Plants of Nepal in the Ayurvedic contexts

Narendra Nath Tiwari

SUMMARY

Ayurveda is one of the oldest treaties in medical Science. Medicinal and aromatic Plants are the main basis of Ayurvedic therapy. Hundreds of species of higher plants are used in Ayurvedic system, most of them available wild in the Indian sub-continent.

Nepal's climatic diversity and variations in altitudes offers grounds to grow a large number of medicinal and aromatic plant species in the wild. These are providing primary health care facilities in rural areas in the form folk or household remedies. Majority of these locally used medicinal plants is also used in the Ayurvedic system that is currently practiced mostly in the urban and sub-urban localities of the country.

Most of the locally used medicinal plants including those used in the Ayurvedic system are increasingly facing different levels of threats on account habitat destruction accompanied by the of lack management practices, over exploitation, etc. These factors are posing serious threats to their existence in future.

In order to assure conservation, management and development of the Ayurvedic medicinal plant sector of the country, the following four inevitable steps are suggested to implement for promising results:

a. Preparation of database of medicinal plants;

b. Conservation of habitats in general and those of threatened medicinal plants in particular;

c. In-situ and Ex-situ conservation of commercially important medicinal plants with emphasis on their cultivation; and

d. Research efforts focussed on medicinal plants with aims at developing simple propagation techniques, identification of active principles, existing and potential uses and possible substitutes on enough scientific grounds.

Acknowledgement: The author is grateful to IDRC/MAPPA for the invitation to attend the Regional Workshop at Pokhara, Nepal.
EVALUATION AND RECOMMENDATIONS
The comments below have been compiled from the participant comment sheets submitted to IDRC at the end of the Market Day Poster Session on Sunday, January 21, 2001. Participants outlined a number of insights gained from the Market Day session as well as some project areas that they found particularly interesting and relevant to their own work. Participants also mentioned things that they had hoped to see in the session but didn’t as well as research areas that they would have liked to see more information on.

The following are ‘take home lessons’ or insights that the participants gathered from the Market Day Poster Session:

- Recognition, documentation, and dissemination of knowledge about MAPs and their potential in private lands and community forestry in tropical, sub-tropical and temperate climates are urgently needed. There is the need for a collaborative effort on this from government, donor, research and academic institutions (S. P. Dahal, MOFSC, Nepal)

- The MAP sector is complex, multidisciplinary, and has multi-stakeholder issues (Prof. M. Iqbal Choudhary, HEJ Research Institute of Chemistry, Karachi, Pakistan)

- MAPs are coming up as the alternative, and need strict and judicious use (Dr. Krishna Kaphle, IAAS, Rampur, Nepal)

- A holistic approach is required for sustainability (Prof. M. Iqbal Choudhary, HEJ Research Institute of Chemistry, Karachi, Pakistan)

- Good linkage is necessary (Dr. P. Tetali, Naoroji Godrej Centre for Plant Research, Pune, India)

- The community should be involved for effective conservation and management of MAPs (Pradip Maharjan, HPPCL, Kathmandu, Nepal)

- Central decision-making may not be appropriate at local levels (Plenary)

- MAPs have high potential for improving the livelihoods of people (S. P. Dahal, MOFSC, Nepal)

- Local communities are the true resource managers with vested
interest in the conservation and sustainable use of their resources (Dr. Nirmal Bhattarai, DPR, Kathmandu, Nepal)

- Collection is related to social cooperation of ethnic groups (Dr. S. Vedavathy, Herbal Folklore Research Centre, Tirupati, India).

- MAP projects must recognize both local health care needs and the need for income generation (Plenary).

- Action research needs to create economic incentives (Dr. S. Vedavathy, Herbal Folklore Research Centre, Tirupati, India).

- Training and capacity building programs at the community levels are the only viable solutions to conserve and manage forest resources (Dr. Nirmal Bhattarai, DPR, Kathmandu, Nepal).

- International funding is playing a catalytic role in local projects in the MAP sector (Prof. M. Iqbal Choudhary, HEJ Research Institute of Chemistry, Karachi, Pakistan).

- Research should be headed towards the applicable and economically viable ventures only (Pradip Maharjan, HPPCL, Kathmandu, Nepal).

- More research and development is needed in the development of propagation methods, materials for endemic and commercially important MAPs (Pradip Maharjan, HPPCL, Kathmandu, Nepal).

- Expertise needs to be developed in particular areas, e.g. large-scale propagation methodologies by tissue culture, etc. (Dhruv Raj Bhattarai, HPPCL, Kathmandu, Nepal).

- In an open-access system, cultivated materials cannot compete with wild harvested materials (Plenary).

- It is mostly commercial species that are domesticated for their sustainable availability and production (Dhruv Raj Bhattarai, HPPCL, Kathmandu, Nepal).

- ‘Small is Beautiful’ (Dr. P. Tetali, Naoroji Godrej Centre for Plant Research, Pune, India).

- NGOs are doing better jobs (Dr. P. Tetali, Naoroji Godrej Centre for Plant Research, Pune, India).

- The Department of Forest plays important roles in promoting medicinal plants in South Asia; this is lacking in Sri Lanka (Lakshmi Arambewela, ITI, Colombo, Sri Lanka).

- Poster session is very attractive and useful. Much interaction has been possible with the researchers within short time (Dr. Nirmal Bhattarai, DPR, Kathmandu, Nepal).

- The number of MAP species recorded in Nepal has increased from 700 to
1624 species (Dr. Krishna Kaphle, IAAS, Rampur, Nepal)

• Traditional knowledge should be validated (Plenary)

• Interaction should be encouraged throughout a meeting (Dr. Tom Hammett, Virginia Tech., USA)

Participants found the information presented on the following topics particularly interesting and useful to their own projects:

• The general descriptions and excellent pictures of different MAPs (Krishna Kumar Pant, IAAS, Rampur, Nepal)

• The natural stock of important MAPs has to get assessed for further planning and development initiatives (Prem Narayan Kandel, District Forest Office, Humla, Nepal)

• Networking with organizations/projects focusing on MAPs (Charles Pradhan, Canadian Coorperation Office, Kathmandu, Nepal)

• The number of people/organizations looking at sustainable use of medicinal plants. (Pushp Jain, TRAFFIC-India, New Delhi, India)

• The utilization of information resources in programs and projects (Charles Pradhan, Canadian Coorperation Office, Kathmandu, Nepal)

• The concept of backyard herbal garden presented by Dr. Ferdousi Begum is a very practical solution to face the growing shortage of frequently needed medicinal plants (Dr. Nirmal Bhattarai, DPR, Kathmandu, Nepal)

• Conservation, cultivation, and domestication issues and MAP ecology (Dr. Narendra Nath Tiwari, Ayurveda Campus, T.U., Kathmandu, Nepal)

• The ex-situ conservation of medicinal plants by backyard home garden (Kuber Jung Malla, DPR, Kathmandu, Nepal)

• The conservation assessment and management plan preparation of MAPs (Dhruv Raj Bhattarai, HPPCL, Kathmandu, Nepal)

• The medicinal plant conservation as undertaken by FRLHT (Rabindra Shukla, HPPCL, Nepalganj, Nepal)

• SHER's success in propagating Aconitum heterophyllum from rhizome cuttings is a good guideline for identical efforts in Nepal (Dr. Nirmal Bhattarai, DPR, Kathmandu, Nepal)

• Information on in-situ cultivation of MAPs (Shakeel Haider Zaidi, Pakistan Forest Institute, Peshawar, Pakistan)

• Techniques for the propagation of MAPs through rhizomes cuttings
Sharing Local and National Experience in Conservation of Medical and Aromatic Plants in South Asia

(Krishna Kumar Pant, IAAS, Rampur, Nepal)

- The different models of medicinal plants cultivation being experimented with by IIFM/Indian Environment Society (Pushp Jain, TRAFFIC-India, New Delhi, India)

- Information about the cultivation of Aconitum heterophyllum in Garhwal (Kuber Jung Malla, DPR, Kathmandu, Nepal)

- Information about proper methodologies of domestication (Prem Narayan Kandel, District Forest Office, Humla, Nepal)

- The leasing of government land in forests for growing medicinal plants to small farmers (Dr. Zahoor Ahmed, Pakistan Agricultural Research Council, Islamabad, Pakistan)

- The marketing of MAPs for community income generation and resource utilization (Rabindra Shukla, HPPCL, Nepalganj, Nepal)

- The awareness of local collectors for sustainable collection and marketing issues (Prem Narayan Kandel, District Forest Office, Humla, Nepal)

- Information on different medical systems under one roof (Krishna Kumar Pant, IAAS, Rampur Nepal)

- Valuable information on the threatened plants of Maharashtra and Karnataka states in India (Dr. Nirmal Bhattarai, DPR, Kathmandu, Nepal)

- Good information on ethnobotanical uses of indigenous plants (Dr. Nirmal Bhattarai, DPR, Kathmandu, Nepal)

- Rapid vulnerability assessment to be used in traditional health care systems (Shakeel Haider Zaidi, Pakistan Forest Institute, Peshawar, Pakistan)

- The names and categories of red-listed plants in Karnataka (Kuber Junj Malla, DPR, Kathmandu, Nepal)

- Non-timber forest products in Nepal (Shakeel Haider Zaidi, Pakistan Forest Institute, Peshawar, Pakistan)

- The method of preparation of herbaceous samples using computer (Lakshmi Arambewela, ITI, Colombo, Sri Lanka)

- Interesting information on high-altitude ethnobotany obtained from Dr. Yildiz and Kate Armstrong (Dr. Nirmal Bhattarai, DPR, Kathmandu, Nepal)

- Thin layer chromatography for MAP evaluation (Dr. Krishna Kaphle, IAAS, Rampur, Nepal)

- The presentation and display of clear and informative posters (Dr. S. Vedavathy; Herbal Folklore Research Centre, Tirupati, India)

The following are things participants were looking for but didn’t find in the Market Day Session:
Summary of Participants' Comments

- Full paper concerning presentation and reference/publication lists of the concerning research organizations (S. P. Dahal, MOFSC, Nepal)
- Simple handouts at every posters (Dr. Tom Hammett, Virginia Tech., USA)
- Sign up sheets for those who were interested in receiving more information from posters presenters (Dr. Tom Hammett, Virginia Tech., USA)
- Presentation of some brief case studies (Prof. M. Iqbal Choudhary; HEJ Research Institute of Chemistry, Karachi, Pakistan)
- Result-oriented information, which was shown by very few posters. This may result in the lack of existing information to the participants (Dhruv Raj Bhattacharai, HPPCL, Kathmandu, Nepal)
- Basic research studies focused on number of MAP species, area, resource inventories, etc. (Plenary)
- MAP studies looking at biodiversity and whole system impacts (Plenary)
- Documentation of ethnic people's knowledge (Dr. Narendra Nath Tiwari, Ayurveda Campus, T.U., Kathmandu, Nepal)
- A tie-in of the programme with farmers and user organizations (Prof. V.P.K. Nambiar, Arya Vaidyasala, Kottakkal, Kerala, India)
- Participation of the user groups (Dr. Narendra Nath Tiwari, Ayurveda Campus, T.U., Kathmandu, Nepal)
- Participation of commercial partners (Prof. M. Iqbal Choudhary, HEJ Research Institute of Chemistry, Karachi, Pakistan)
- Citation of botanical names at many instances (Prof. V.P.K. Nambiar, Arya Vaidyasala, Kottakkal, Kerala, India)
- Address of institutions and organizations involved in in-vitro and in-vivo study of MAPs (Dr. Krishna Kaphle, IAAS, Rampur, Nepal)

Participants would have liked to see more information on the following topics:

- Monitoring elements for sustainable use of MAPs (Plenary)
- Analysis of conservation and economic aspects of MAPs (Charles Pradhan, Canadian Cooperation Office, Kathmandu, Nepal)
- Samples of medicinal plant-based processed/semi-processed products (Dr. Nirmal Bhattacharai, DPR, Kathmandu, Nepal)
- Cultivation techniques of more useful and high value medicinal plants (Kuber Jung Malla, DPR, Kathmandu, Nepal)
- Agrotechnology of cultivation of tropical MAPs (Rabindra Shukla, HPPCL, Nepalganj, Nepal)
• MAP cultivation and marketing (Dr. Tom Hammett, Virginia Tech., USA)

• Markets and marketing chain/channel (Dr. Nirmal Bhattarai, DPR, Kathmandu, Nepal)

• Income generating activities through medicinal plant management and cultivation (Kuber Jung Malla, DPR, Kathmandu, Nepal)

• Micro-enterprises based on NTFPs (Rabindra Shukla, HPPCL, Nepalganj, Nepal)

• Marketing of medicinal plants (Kuber Jung Malla, DPR, Kathmandu, Nepal)

• Marketing and marketing methods (Lakshmi Arambewela, ITI, Colombo, Sri Lanka)

• Marketing of NTFPs from communities in a collective way (Rabindra Shukla, HPPCL, Nepalganj, Nepal)

• Market information on internationally traded MAP species (Dr. Nirmal Bhattarai, DPR, Kathmandu, Nepal)

• Appropriate market price information systems (Rana Rawal, Ban Udyam-BSP/ NewERA EFEA)

• Value added product technology and information on marketing avenues and buy back arrangements (Dr. S. Vedavathy, Herbal Folklore Research Centre, Tirupati, India)

• Value addition and medicinal plants (Lakshmi Arambewela, ITI, Colombo, Sri Lanka)

• Commercial-scale propagation techniques for Dactyloziza hatagirea (Pradip Maharjan, HPPCL, Kathmandu, Nepal)

• Germination techniques and markets for MAPs (Krishna Kumar Pant, IAAS, Rampur, Nepal)

• Propagation of endemic, threatened, and economically important species (Plenary)

• Quantitative estimation of NTFPs in nature (Dr. Nirmal Bhattarai, DPR, Kathmandu, Nepal)

• Artificial propagation and plant potency (Krishna Kumar Pant, IAAS, Rampur, Nepal)

• The reliability of traditional systems in the face of changes (mutation) in plants over time (Krishna Kumar Pant, IAAS, Rampur, Nepal)

• Enrichment planting (Plenary)

• Inter-cropping of MAPs with other crops (Dr. Zahoor Ahmed, Pakistan, Agricultural Research Council, Islamabad, Pakistan)

• Technologies to introduce native species in farmers fields for income enhancement (Plenary)

• Agrotechnology of high attitude MAPs (commercially exploited species) (Rana
Rawal, Ban Udyam-BSP/NewERA EFEA

- Sustainable harvesting methods (Dr. S. Vedavathy, Herbal Folklore Research Centre, Tirupati, India)

- Harvesting technologies (Dr. P. Tetali, Naoroji Godrej Centre for Plant Research, Pune, India).

- Processing packages (Dr. P. Tetali, Naoroji Godrej Centre for Plant Research, Pune, India).

- Processing techniques and post-harvest care as well as different aspects of medicinal plant conservation (Shakeel Haider Zaidi, Pakistan Forest Institute, Peshawar, Pakistan)

- Information on major chemical constituents found in high value MAPs like Nardostachys grandiflora, Neopicrorhiza scrophulariifolia, Dactylorhiza hatagirea, etc. (Pradip Maharjan, HPPCL, Kathmandu, Nepal)

- The chemical composition and the active constituents of MAPs used in traditional healing (Dr. Krishna Kaphle, IAAS, Rampur, Nepal)

- Tissue culture work on certain medicinal plant species (Prof. V.P.K. Nambiar; Arya Vaidyasala, Kottakkal, Kerala)

- Efficacy study and trials for zootechnical efficacy (Dr. Krishna Kaphle, IAAS, Rampur, Nepal)

The following are the questions most commonly asked by visitors to project stands:

- What is the list of medicinal plants looked at? (Shakeel Haider Zaidi, Pakistan Forest Institute, Peshawar, Pakistan)

- How much research work has been carried out on in-situ conservation of medicinal and aromatic plants in the country? (Shakeel Haider Zaidi, Pakistan Forest Institute, Peshawar, Pakistan)

- What are the names of over-exploited medicinal plant species? How many are there? (Dr. Zahoor Ahmed, Pakistan Agricultural Research Council, Islamabad, Pakistan)

- What are the difficulties in motivating local people/communities in the management of MAPs? (Pradip Maharjan, HPPCL, Kathmandu, Nepal)

- How are MAPs impacting on the livelihoods of rural people in Humla, Nepal? (Prem Narayan Kandel, District Forest Office, Humla, Nepal)

- How far does the forest resources sustain the economy of the rural people of Humla? (Prem Narayan Kandel, District Forest Office, Humla, Nepal)

- What are the socio-economic impacts of MAPs in the project area? (Rana Rawal, Ban Udyam-BSP/NewERA, EFEA)
Why haven't these MAPs been commercialized, and how can this be done? (Rabindra Shukla, HPPCL, Nepalganj, Nepal)

What are the Red Listed plants of your country? (Rabindra Shukla, HPPCL, Nepalganj, Nepal)

What are the threats due to non-commercialization? (Rabindra Shukla, HPPCL, Nepalganj, Nepal)

What is the use and extent of sustainable harvesting practice of commercially important MAPs? (Pradip Maharjan, HPPCL, Kathmandu, Nepal)

What are the substitutes or adulterants of high-value medicinal plants? (Pradip Maharjan, HPPCL, Kathmandu, Nepal)

Is sustainable harvest possible? (Rabindra Shukla, HPPCL, Nepalganj, Nepal)

How do you provide the knowledge to the collector for sustainable harvesting methods of MAPs? (Dhruv Raj Bhattarai, HPPCL, Kathmandu, Nepal)

Is the traditional knowledge you are documenting scientific or not? Is there any study to prove that this knowledge is scientific? (Dr. Narendra Nath Tiwari, Ayurveda Campus, T.U., Kathmandu, Nepal)

How could you get the traditional medicinal information from the Vaidyas or healers? (Dr. S. Vedavathy, Herbal Folklore Research Centre, Tirupati, India)

Are the medicines that the communities prepare standardized and quality controlled? (Dr. S. Vedavathy, Herbal Folklore Research Centre, Tirupati, India)

How do you select and prepare the herb for medicinal use? (Dr. Krishna Kaphle, IAAS, Rampur, Nepal)

How much research work has been carried out on the chemical characterization of these plants? (Shakeel Haider Zaidi, Pakistan Forest Institute, Peshawar, Pakistan)

Can you evaluate the changes in plant compounds, and are you doing any work in evaluation the active components of the plant? (Dr. Krishna Kaphle, IAAS, Rampur, Nepal)

How can I get copies of your organization's publications? (Dr. Tom Hammett, Virginia Tech., USA)

Here are some other comments participants had about the market Day poster session:

The high priority given to the posters is a great move by the organizers. The presenters are excellent and knowledgeable and a wide diversity of media/techniques used in the poster session made it very interesting. As an added incentive to get everyone to visit all the posters you could have
each visitor get his/her form signed by the presenters and then use the form as an entry form for a raffle of draw (Dr. Tom Hammett, Virginia Tech., USA)

- It was important to see the high priority given to the posters. At most other meetings, posters are given low priority (Dr. Tom Hammett, Virginia Tech., USA)

- The Market Day process was effective for one-on-one discussion in a limited time and allowed presenters to convey more detail to interested parties than in a short presentation to the whole group. It was very useful for participant interaction and information exchange and allowed different points of view to be debated (Plenary)

- This meeting provided good opportunity for the exchange or knowledge during the market day among researchers in the MAPs sector both within the country and abroad. It is indeed a good endeavor (Pradip Maharjan, HPPCL, Kathmandu, Nepal)

- The workshop provided a good opportunity for the sharing of ideas and for gaining familiarity with research work carried out in South Asian countries (Shakeel Haider Zaidi, Pakistan Forest Institute, Peshawar, Pakistan)

- It is a very good opportunity to share regional experience and research extension, training, and action in MAPs (S. P. Dahal, MOFSC, Nepal)

- Excellent way of exchanging information (Rana Rawal, Ban Udyam-BSP/NewERA, EFEA)

- That was an excellent session. I was able to learn many things related to MAPs (Krishna Kumar Pant, IAAS, Rampur, Nepal)

- Excellent information sharing. Every stall should have their project activities outlined in a brief note to distribute to visitors (Charles Pradhan, Canadian Cooperation Office, Kathmandu, Nepal)

- Market day provided an opportunity for informal interaction (Pushp Jain, TRAFFIC-India, New Delhi, India)

- There is still some confusion over what has been done in MAP related fields and what strategy needs to be taken for the future (Prem Narayan Kandel, District Forest Office, Humla, Nepal)

- Research should be linked both directly to economically viable answers/ventures, and to the propagation of endemic and commercially important species. Market information for international trade is also needed and will be a valuable piece of future workshops (Dr. Tom Hammett, Virginia Tech., USA)

- While issues on the domestication and cultivation practices of MAPs have
been highly stressed, more study on the composition and pharmacological parameters of MAP is needed (Dr. Krishna Kaphle, IAAS, Rampur, Nepal)

- At least the issues of MAPs (i.e. conservation, management, and uses) are becoming highlighted. Sub-sectoral issues should be taken very seriously (Dhruv Raj Bhattarai, HPPCL, Kathmandu, Nepal)

- Proper understanding, commitment, and involvement are needed when the work taken up is linked with ethnic groups and communities. (Dr. S. Vedavathy, Herbal Folklore Research Centre, Tirupati, India)

- People are not interested in our traditional knowledge documentation, and it is a big problem to know how much natural resources we have (Dr. Narendra Nath Tiwari, Ayurveda Campus, T.U., Kathmandu, Nepal)

- The arrangement of participants into small groups of 5-7 participants as a Delphi Technique for the presentation might have been helpful (S. P. Dahal, MOFSC, Nepal)
Workshop Recommendations for The Sustainable Management of Medicinal and Aromatic Plants (MAPs)

- Ecological, socio-economical impacts of unsustainable harvesting uses should be studied;

- Appropriate harvesting and regulations considering seasonality and critical regeneration periods;

- Prioritization of species should include community criteria, needs and local priorities;

- Community monitoring systems in transparent and participatory manner (e.g. key indicator species);

- Cultivation techniques should be based on local practices and should be integrated in overall management of MAPs;

- Need to identify strategies to link indigenous and scientific knowledge;

- Recognition and protection of IPR (e.g. Peoples’ Biodiversity Register);

- Need for technological innovation for value addition in different levels (e.g. primary processing);

- Need to develop appropriate strategy for certification of products to strengthen markets;

- Need to develop cost-effective certification process;

- Need for mechanisms for micro-finance for local enterprise development;

- Need to develop more secure land and resource tenure system;

- Strategies for regional cooperation for conservation and management should be adopted;

- Increased understanding of market chain involving all stakeholders;

- Donors to be persuaded to support conservation;

- Recognize issue of validation and develop appropriate strategy such as self-regulating bodies for systems of medicine (e.g. Malaysia);

- Develop strategies for training such as centers for excellence in key areas.
such as authentication of MAP species;

- Development of information database on species, market, and health and dissemination of knowledge using appropriate communication means;

- Influencing policy makers to give higher priority to traditional systems of medicine;

- Policy on royalties for cultivated products should be reviewed and enforcement should be facilitated;

- Support traditional healers to organize.
Workshop Evaluation by the Participants

General

Scale: 1 = Poor  
2 = Unsatisfactory  
3 = Satisfactory  
4 = Good  
5 = Excellent

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Workshop Evaluation by the Participants

Working Groups

Scale: 1 = Poor  
2 = Unsatisfactory  
3 = Satisfactory  
4 = Good  
5 = Excellent

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Workshop Evaluation by the Participants

Overall Workshop

Scale: 1 = Excellent
2 = Good
3 = Satisfactory
4 = Unsatisfactory
5 = Poor

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MAPPA Publications

The Medicinal Plants Sector in India by Jason Holley & Kiran Cherla

Priority Species of Medicinal Plants in South Asia by Madhav Karki & J.T. Williams

Priorities for Medicinal Plants Research and Development in Pakistan by J.T. Williams & Zahoor Ahmad

Tribal Folk Medicinal Plant Resources of South Asia by Radhika Johari & Madhav Karki

The Role of Medicinal Plants Industry in Fostering Biodiversity Conservation and Rural Development by Madhav Karki & Radhika Johari

Some Important Medicinal Plants of the Western Ghats, India- a profile by P.K. Warrier, V. P. K. Nambiar and P.M. Ganapathy

CAMP Report, Nepal by Dr. Nirmal Bhattarai, Mr. Vinay Tandon & Madhav Karki
This publication is a compilation of the papers presented at the Regional Workshop on “Sharing Local and National Experience in Conservation of Medicinal and Aromatic Plants in South Asia” held in Pokhara, Nepal from 21st to 23rd January 2001. The book reflects the richness and diversity of the projects, development experiences, innovative ideas and both modern and traditional practices documented and presented by the policy makers, researchers, resource managers, conservation scientists, field workers, development planners and community farmers of different countries in South Asia.

The proceedings have the recommendations on future strategies for improving the thrust, focus and impact of the external support to sustainable use of medicinal and aromatic plant resources of South Asia. The technical information and institutional frameworks documented in the publication, we believe, lay a strong foundation for the systematic conservation and sustainable development of medicinal plants in the Himalayas. The book will be a good and useful source of information on medicinal plant research projects, institutions, individual researchers and bibliographic literature.

**Medicinal and Aromatic Plants Program in Asia (MAPPA)**

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Tel.: 91-11-461-9411
Fax: 91-11-462-2707
mappa@idrc.ca/saro
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