

Healing Forests Healing People

*Report
of a Workshop on
Medicinal Plants
held on
6-8 February, 1995
Calicut, India*

by
**Manjul Bajaj
J.T. Williams**



**Medicinal Plants Research Network
International Development Research Centre
New Delhi**



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THE MEDPLANTS RESEARCH NETWORK

The International Development Research Centre initiated in April 1994 a Medicinal Plants Research Network operating out of its South Asia office. This network aims at supplementing international and national/regional efforts in the area of medicinal plants by supporting research and development at local/micro levels. It is the aim of the network to facilitate collaboration, coordination, interaction and multidisciplinary research via networking between the different actors. The network has adopted a proactive, user based biodiversity conservation strategy and efforts are targeted at undertaking research in partnership with existing users of the resource base - local communities and indigenous industry. Focal areas of research include documentation of folk traditions and knowledge, in situ conservation, developing appropriate harvesting and cultivation techniques, improved quality control, storage and processing techniques.

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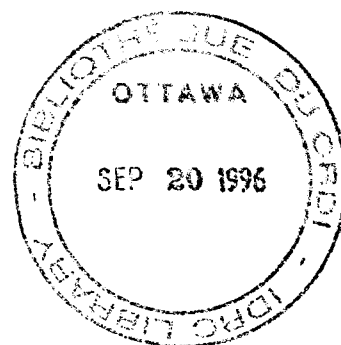
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PREFACE

With several hundred plant species of medicinal value distributed in different ecosystems, many thousands of rural and tribal poor involved in their collection, processing and marketing and probably an equal number engaged in health care practice based on this resource, the environmental and economic importance of medicinal plants to the countries of South Asia is enormous. However, the rich and diverse heritage of traditional medicine systems in the subcontinent is increasingly threatened by the interplay of a number of factors : rapid deforestation and habitat destruction; indiscriminate collection and an exploitative trade network; the entry of cheap and spurious substitutes in the market; and paucity of research and resources directed at the systematic cultivation of some of these species.

In response to a large number of proposals received on various aspects of medicinal plants research, the International Development Research Centre initiated in April 1994 a Medicinal Plants Research Network operating out of its South Asia office. The report which is presented here summarizes the discussions of the first meeting of the network held on 6-8 February, 1995. This meeting brought together a select group of practitioners, researchers, social scientists and development professionals from Bangladesh, India, Nepal and Sri Lanka, along with a few key participants representing the donor community. A major objective of the meeting was to seek a consensus on how the network should be organized, what should be the research priorities and what guidelines should be used in conducting research. Consensus was reached through the working group, reporting and discussion methods.

This report succinctly brings together the main issues relating to this very important subject and also distills the collective wisdom of the group in the shape of two specific outputs - one, a section on research priorities highlighting future directions and two, a Code of Conduct for researchers engaged in this highly sensitive area of research. I am of the opinion that it will be a very useful reading for all those working in the areas of biodiversity conservation, indigenous knowledge and traditional medical systems.

I would also like to take this opportunity to thank all the participants for their contributions, specially those who agreed to chair the different sessions - Keith Shawe, P.V. Subba Rao, John Lambert and A.V. Rao, as well as the lead discussants and resource persons for the thematic sessions and working groups - Trevor Williams, Vijayalakshmi Ravindranath, P.R. Krishnaswamy and Manjul Bajaj. Thanks are due also to Dr. P.K. Warriar and Dr. V.P.K. Nambiar and all the staff of the Arya Vaidya Sala, Kottakal for their hospitality and for arranging a very productive field trip and to K. Ashok of IDRC's Forestry Program for managing the show behind the scenes.

May 25, 1995

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THEMATIC DISCUSSIONS

1 . BIODIVERSITY

Key Elements of Biodiversity Research

Biodiversity is the variety and variability of plant and animal species on the planet. There is a distinction between biological **resources** and biological **diversity**. Diversity itself has a particular value and importance - the genetic variation within species, the variety of species themselves, and the existence of diverse and productive ecosystems are of economic importance. Equally important, especially in developing countries, is the human knowledge that makes this diversity useful. This is especially true of medicinal plants, the uses of which have been evolved by indigenous peoples, and may or may not then have been formalised in traditional medicine systems. Eighty percent of the world's population is dependent on traditional medicines and medicinal plants for their health security, and more than two third of the world's plant species occur in developing countries. In this context, it can be seen that the conservation of medicinal plant biodiversity, like the conservation of agricultural diversity, is critical to the survival of developing countries in general, and indigenous peoples in particular.

Threats to biodiversity as a result of development, land use changes and over-exploitation, require that urgent action is taken to meet the future requirements of expanding populations for specific useful biodiversity. There is now widespread acceptance that it is an international cooperative responsibility to ensure that the conservation, development and use of biodiversity is sustainable, systematic and equitable.

Particularly to ensure sustainability, there is a need to define priorities for research on medicinal plant diversity. Choices may have to be made between conserving the most threatened species and protecting the more useful species.

There are five key elements to consider in any programme on biodiversity research:

- 1) Understanding biodiversity
- 2) Monitoring biodiversity
- 3) Conserving biodiversity
- 4) Managing biodiversity
- 5) Utilizing biodiversity

Understanding Biodiversity: An understanding of biodiversity is essential to determine whether or not it should be conserved, and how it should be managed.

Monitoring Biodiversity: A complete understanding of biodiversity is an unrealistic goal in the short-term, however, as natural systems are dynamic. Long-term monitoring of biodiversity is therefore necessary to develop a more detailed understanding of its value for conservation and sustainable use.

Conserving Biodiversity: The ethos of many international conservation agencies remains a static one of preserving the status quo. The Global Biodiversity Strategy has recognized the importance of conserving medicinal plant biodiversity under Article 40 which calls for the development of traditional medicines to ensure their appropriate and sustainable use, and under Action 67 which recognizes the need to place greater emphasis on the conservation of gene pools of so called minor crops of local or regional importance. Medicinal plants were specifically mentioned as a key group particularly deserving increased attention since a number of them have been taken into cultivation and many more are likely to be cultivated in the future. The IDRC Network could perhaps focus particular attention here on the balance between *in situ* and *ex situ* approaches to conservation, including the role of local people in conservation and in production through cultivation. By raising awareness among local people of the value of indigenous medicinal plant biodiversity and by appropriate interventions for conservation and utilization, sustainable conservation of medicinal plant biodiversity can be hopefully achieved at the local level.

Managing Biodiversity: Threats to biodiversity which stem from the high rate of human population growth include: over-exploitation of the biotic and supporting physical environment, habitat loss and fragmentation, invasion by introduced species, pollution, global climate change, industrial agriculture and forestry. In 1992, the Rio Earth Summit identified management of natural resources as a priority. Appropriate *management* of the conservation and utilization of medicinal plant biodiversity is fundamental.

Utilization of Biodiversity: The sustainable utilization of biodiversity should be a guiding principle for any research proposed by the network, and depends upon the integration of :

- 1) **Biosystematics:** Especially biological reference systems based on distribution of species and diversity, identifiers such as taxonomic systems, and a knowledge of patterns of variation.
- 2) **Resource Utilization:** The accumulated knowledge and research opportunities and capabilities on the economic values of specific plants.
- 3) **Conservation:** When sustainably managed conservation of species and populations is necessary.

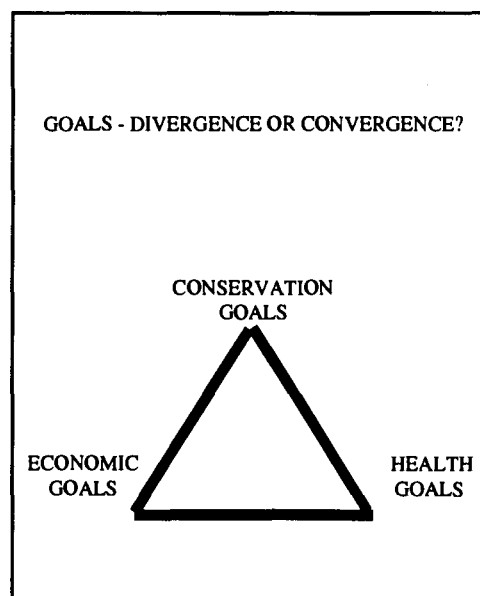
Associated with sustainable utilization, however, are a number of issues which the network needs to consider. These include intellectual property rights and the recognition of indigenous technical knowledge.

Any research priorities developed should include consideration of the five key elements in order to focus on the equitable and sustainable development and conservation of the medicinal plant resource base through the involvement of local people.

Highlighting the Key Issues

The following issues were identified :

- What is the state of knowledge with respect to the loss of medicinal plant biodiversity in the region and in sub-regions such as the Himalayas? How complete and reliable are the available listings of threatened and endangered species (see Facts and Figures Section for the country-wise lists tabled for discussions). How consistent are the approaches between countries? Is concern essentially to be focused on species diversity or does it need to be extended to intra-specific variation and genetic diversity?
- Is there an inherent contradiction between economic and health goals on the one hand and biodiversity conservation on the other? What approaches exist to synchronize environmental goals with the development goals?
- In some cases utilization will call for identification of active ingredient, drug development and supply from cultivation; in others, cultivation will continue to provide crude plant extracts. Is conservation of the wild gene pool more important in one scenario than the other? The active ingredient/drug development/cultivation approach may identify very limited genotypes to be preserved while preserving biodiversity means preserving as many plants and eco-systems as possible.



- What are the strategies by which cultivation of a valuable species once collected from the wild will contribute to the protection of the wild gene pool?
- How can the role of communities in protecting medicinal plant biodiversity be recognized and reinforced?
- To what extent is it possible and desirable to involve the private sector more in medicinal research? What systems and safeguards need to be put in place? Would potential pay-offs outweigh risks?
- What relative emphasis needs to be placed on giving the primary role and responsibility for action to local communities and local industry and to maintain appropriate policy and regulatory regimes, enforce legislation and monitor and highlight areas of cumulative impact on the state sector (including national and international agencies)?

A Summary of the Discussions

The majority of medicinal plants used in South Asia come from forest ecosystems. These wild resources are declining rapidly due to loss of forests and to over exploitation, legal and illegal, to meet high market demands for medicinal plant material. A first step for each country in the region should be to prepare an inventory of medicinal plants and to quickly assess the magnitude of the problem on the basis of data obtainable from State/Provincial and National Ministries, universities, herbaria, etc. There is a need to document detailed distributions of target species and to ensure their conservation. Additionally, bringing into cultivation specific genetic material (and ensuring quality) will to some extent relieve pressures on natural populations. These efforts have to be backed by responsible public policy to balance conservation and sustainable exploitation for the public good.

Actual or planned ecosystem conservation should also be reviewed to see that it adequately covers the target resources. Much of the effort on medicinal plants appears haphazard and interests of various conservation groups do not converge as they should. In order to provide a basis for strategic action it should be possible to map areas of distribution and identify on the basis of species, which will be prioritized, a limited number of "hot spots" or centres of diversity. These can then be collated with ecosystem conservation targets of the forestry, agriculture and environment sectors. For instance, the World Conservation Monitoring Centre has singled out six areas in India for priority action vis-a-vis plant species diversity and it is unclear if this covers more than a small part of the useful medicinal plant diversity. Strategic alignment of such existing information into national conservation area planning is needed. Such an approach will improve the current ad-hoc approaches to ecosystem and buffer zone conservation and management.

Moreover, since medicinal plant products are to a great extent shared regionally between the countries a congruence of conservation strategies and trade legislation would be required - e.g. a ban on the export of a certain species in Nepal would be rendered ineffective if trade is permissible across the Indian border. Also bans on export of materials, even if they are not defeated by illegal cross-border trade, provide only short-term solutions but lose much-needed hard currency when export is to developed countries. It makes sense to formulate regional conservation strategies and to accept a common set of guidelines and principles across the region.

There is an urgent need also to define systems that allow for collecting of wild material and yet provide the means for in situ conservation. Wild resources are declining rapidly due to unregulated over exploitation to meet local, regional and international demands and a major job has to be done to develop education/training package for collectors, traders and practitioners. Existing efforts with training approaches need to be critically analyzed and understood before proceeding further - e.g. in India the Uttar Pradesh government has in place a scheme for its hill districts whereby collectors are trained in sustainable harvesting practices and issued identity cards and permits thereafter for collection from the wild. However, the scheme does not always work and it would be important to study why, to understand the complexities and to aid the designing of future practices and policies.

Although some Ayurvedic houses do have standards, emphasis on quality of supply and quality of product is low. From collecting plant material in the wild, or from cultivation through to consumption in medical systems a whole range of people - collectors, farmers and practitioners - are involved. Without collective purpose and collective action the sheer numbers of plant species used in treating common medical problems in primary health care such as diarrhoea, respiratory conditions, pain from rheumatism, arthritis, wounds etc. leads to practical problems of local over-exploitation. It was pointed out by traditional practitioners that requirements for certain plants in their traditional systems were inevitably destructive - e.g. when roots or flowers are needed. For these the only viable strategy in the long run would be cultivation.

Cultivation becomes even more important when one considers that massive collecting for domestic or international sale as in the case of *Rauwolfia*, led to depauperation of genotypes in nature. By the time the Indian Government had placed a ban on export of wild material, what little supply was left was of genotypes with very low alkaloid contents.

Current medicinal plant resources are a long way from being enhanced by breeding except in a few cases of special selection. It is hardly appropriate at this stage to talk about genetic resources : the action needed is clear - conserve as much diversity as possible until more is known about patterns of variation and thereafter genetic resources will require attention. It would be futile to build up large genetic resources collections for their own sake at this stage. Moreover, apart from geographical and ecological partitioning of diversity within species, evidence shows that contents of active principles vary widely from source to source. Local knowledge has to be abstracted in this respect.

Screening of active principle contents is necessary in supply systems, since active principles vary tremendously in concentration between different plant sources in the wild. It is essential that collecting and selection of types for cultivation is made from populations with products possessing known efficacy of desired compounds. Ideally, genetic selection could lead to genetic uniformity with better chances of more standard production. In pursuing such a course the genetic base needs to be kept to ensure future evolution and fitness. Propagation by vegetative means helps standardization, and if variability is needed it can be generated from time to time through sexual reproduction.

Confidence on the value of the plants would be much higher if selected genotypes, identified in interaction with ethnopharmacological knowledge were brought into cultivation and screened for genotype-environment interactions affecting contents of principles. At the same time, the cultivation methods, whether in plantation or agroforestry systems or enrichment planting in natural forest systems will need to be standardized to avoid the creation of new variables.

The Ayurvedic and Unani pharmaceutical houses are more or less totally dependent on crude plant materials collected from forests and little attempt has been made for cultivation. The initiative of IDRC to involve the local private sector (see Facts and Figures Section) is a step in the right direction and the approach needs to be strengthened and expanded. Several areas where private participation could make a critical difference were suggested for future programme development:

- identification of priority species for research and development
- support of community based conservation efforts targeted at key eco-systems
- development of buy-back agreements with cultivators for key plant materials
- establishing research partnerships to develop improved processing/ storage/ quality control procedures
- development of commercial supply of quality seeds and germplasm

In summation, a multi-pronged approach is needed to balance sustained supply of quality plant materials with conservation of the species diversity and to develop supply systems appropriate to the diverse interests of people, practitioners and to the benefit of all.

2. SAFETY AND EFFICACY

Traditional Medicine - Modern Perspectives

Herbal medicines play an important, and even dominant role in many parts of the world. There is widespread interest in placing herbal medicines in an appropriate scientific framework, by assessing their safety, efficacy and quality according to modern standards. These assessments, however, should take traditional uses into account and should therefore avoid any exaggerated claims. The reason why traditional medicine has shown remarkable clinical effects is that there is a unique theoretical system, which has been examined under clinical practice for thousands of years and is the generalization and summation of experiences. The question is whether it is possible to explain this theoretical system in modern scientific terms and to investigate completely the scientific value of these ancient philosophies, so that they could play an even more important role in the health care of human beings. This is a complex and challenging question.

Considerable interest has been generated by the WHO on the various aspects of assessment of herbals. The WHO Consultation to Review the Draft Guidelines for the Assessment of Herbal Medicines which met at Munich, Germany, in 1991 and addressed the following :

- Pharmaceutical assessment (crude plant material, plant preparations, finished products, stability);
- Safety assessment (toxicological studies, documentation of safety based on experience);
- Assessment of efficacy and intended use (pharmacological activity, evidence required to support indications);
- Combination products;

- Product information to consumers;
- Promotion.

The guidelines of WHO on the assessment of traditional plant medicines need to be reviewed and built into proposals for network research.

Finally, it is important to differentiate between the kinds of studies that may be undertaken in this vast area of research and to appreciate that different approaches are targeted at achieving significantly different outcomes. Two approaches can be delineated but they are not mutually exclusive and each has a role to play in achieving better health care in developing countries. It is useful to distinguish between the two while defining the network's strategy.

- Approach 1 : Modern scientific studies to establish the scientific basis for the efficacy of traditional/folklore medicine.
- Approach 2 : Search for new drugs using information from folklore medicine.

The first approach retains the focus on indigenous health care systems while the second shifts it exclusively to the modern sector.

Highlighting the Key Issues

Quality Control in the Use of Herbal Preparations

Why is there a need to address quality? Quality control impinges on all aspects of the use of herbal preparations but the following were discussed at length:

Plant Identity

Identification of the actual plant is not always easy. Sometimes two plants are known by the same local name. When the plant is being collected, it is very possible that another plant is being collected at the same time and this will be mixed up with the plant which actually has the activity. A second area of concern is that plant collectors may substitute cheaper or alternative plant material that look the same as the material which has the therapeutic effect. It is very important, therefore, when laying down standards for a herbal product to lay down clear-cut standard nomenclatures and criteria to 'finger print' that the substance being used is actually the substance which should be used.

Collecting Data:

Environmental aspects affect active principle contents. Such aspects include soils, altitudes and others. However, many species are known to possess chemotypes with genetically controlled contents differing between similar-looking plants. Other plants need to be collected at certain times during the 24th period, in others too much juvenile material can include unwanted precursor chemicals. Specific details on collecting procedures are needed and need to be clear to any paid collector.

Age of Plant

Quality of the active principle frequently depends on the age of the plant part. This is certainly the case for berberine from roots of species of *Berberis* and some others such as *Tinospora* and *Cascinium*. Where there are industries processing herbals, as in this case in the Punjab and UP, for export to countries such as Japan, the collecting is done by private contractors. They uproot the plants, and often pay no attention to which roots or which parts of roots to collect. Guidelines are needed and ethically there should be codes of practice to at least see that some plants are regenerated rather than killed totally by the collecting.

Processing

Each plant product is processed by drying, separating into parts, pulverising or powdering. Further processing is done by the traditional practitioner to produce oils by pressing, infusions, decoctions or incorporating into ointments or syrups or mixing with milk or inorganic substances such as sulphur and alum. Standards related to cleanliness are essential. There are documented cases of herbals being heavily contaminated with coliform bacteria, insect fragments and even pesticides. There are hazards at all stages from collecting to incorporating into preparations and better standards are needed.

Many potential hazards would be reduced if standard preparations became extended more on the basis of quality control and the preparation of standard doses using sterile capsules, pills and other mechanisms certifying the expiry dates, mg of active component per 100 g of material and safe dosages made clear.

A Summary of the Discussions

There was a division of opinion between those who held that heightening emphasis on safety and efficacy of traditional medicines was misplaced and exaggerated and emanated from a 'Western' scientific bias and those who believed that these were very real and key concerns which need to be addressed in order to strengthen and uphold continued usage of herbals. Adherers of the first viewpoint

held that safety is not an issue locally - safety in most cases is proven through long and documented usage over generations, and moreover, these systems are governed by their own pharmacopoeias and regulatory systems which function effectively. Imposition of rigorous testing standards and quality control procedures would impose high costs in terms of time and money and reduce the accessibility, affordability and cultural/ contextual relevance of herbal remedies.

On the other hand it was pointed out that as long as herbal medicines were grown locally and used fresh it may not have been necessary to carry out extensive procedures of standardization. However, herbals are now being prepared in factories and pharmaceutical houses and packaged, stored and transported to markets across the region and abroad, bringing the whole issue of standardization of remedies and quality control - of plant parts used, of processing methods and conditions and of final products - to the fore of discussion. The fact is that the demand for standardization of products has been a long-standing one from Ayurvedic practitioners themselves who have highlighted that the entire system is being undermined due to the availability of spurious and sub-standard drugs in the market. In many cases identity is spurious, materials can be old, dosages are not labelled well nor toxicities stated if dosages are exceeded.

It must also be recognized that tradition changes with time and the traditional systems as we know them now are the product of innovations and adaption in the past. For instance, when Devaprasad Sanyal gathered together scattered information on herbal remedies in India in 1924, there was no formally recognized or official pharmacopoeia. Hence the medical practitioner had to use his own discretion in the selection of the preparation and its formulation. In the relatively short time since then, this has changed. The entire literature still owes a debt to the *Sanhitas* of Charaka and Susruta and later writers such as Vaghbhatta, Chakradatta and Bhava Misra, but there has been more unravelling of the medical properties of herbal drugs and changes in the standard preparations. When this occurred, as earlier in this century, a number of herbal drugs were commercialized and came into daily household use. Also, in India, herbal remedies have been expanded or changed from time to time with the introduction of plants from other parts of the world, for instance *Adansonia* from Africa used in treatment of fevers or *Argemone mexicana* used in treatment of dysentery. These trends will continue and are essential to maintaining the relevance and vitality of the traditional systems.

It was felt that standardization may hold the key to further advances and substantive research needs to be carried out on this. The technology currently available is not able to develop suitable quality control criteria for crude extracts, decoctions and compound formulations typically used by traditional practitioners. Sizeable resources and research attention need to be committed to developing methodologies and test methods for quality control.

The general consensus seemed to be that while modern methods of evaluation, testing, standardization and quality control do have a role to play in enhancing the capacity of traditional systems to meet the

health care needs of a larger, more dispersed and rapidly urbanizing population, the issues need to be approached with a greater understanding and appreciation of the knowledge and systems already extant than has hitherto been the case. For instance, as regards plant identity, existing traditional manufacturers have in place a fine sense of quality control. Requisite quality is determined by experienced personnel based on smell, taste, feel, look and other indicative variables distinguishing between acceptable and spurious plant materials and grading the quality of the material. The traditional literature also provides extensive guidelines on the morphological features of different plants to aid the practitioners in establishing plant identity. A deeper interaction with traditional practitioners and abstraction of traditional knowledge is essential before research to put in place improved systems is embarked upon.

Similarly, assessments of safety and efficacy must take explicit account of the knowledge and empirical evidence accumulated through years of traditional practice. Current practice, with respect to toxicological studies for instance, advocates that the same approach is used irrespective of whether the substance being sought to be tested is a recently synthesized chemical compound, a plant never used before or a plant in widespread use by the local population. Good, controlled clinical trials, after a limited toxicity study would form a more realistic and acceptable approach to plants already in use for millennia.

So too, testing of efficacy or therapeutic activity has tended to concentrate on the traditional extraction, fractionation and animal model approach discarding plants which do not yield results via these methods. This ignores completely the fact that traditional medicine lays a lot of emphasis on the manner in which the plant part is administered e.g. with pepper, syrup, honey etc. with therapeutic activity resting in the particular combination of compounds and not in the plant alone. Ayurveda, for example, operates on the principle of synergy. Its formulations involve several herbs which work in conjunction, diluting each other's toxicity and/or enhancing their therapeutic value. Modern efficacy trials, on the other hand, often search these same herbs and try to isolate and purify a single chemical ingredient in them. When the chemical proves toxic, the plant is discarded and centuries of wisdom becomes controversial overnight. Again, research needs to be directed at developing better methods based on a more complete understanding of traditional practices.

In summation, while modern science undoubtedly has much to contribute to the advancement of traditional health systems, efforts in this direction must proceed from a sound understanding of the knowledge, conceptual underpinnings, methods and practices of the traditional sector.

3. SOCIO-ECONOMIC ISSUES

Towards an Agenda for Socio-economic Research

The growing importance of herbal remedies to European and North American consumers cannot be over estimated. In 1990 there were more than 2000 companies in Europe in the herbal medicine sector. Of these 30% were said to have a turnover in excess of US \$20 million. The size of the German herbal products market in 1989 was \$1.7 billion. More than 100,000 mt of crude plant materials are imported into Europe every year. A survey of “unconventional, alternative, or unorthodox therapies” carried out in the USA revealed that expenditures in 1990 were approximately \$13.7 billion. It would appear that the industrial countries and their pharmaceutical companies have a greater appreciation for what might be profitably exploited than do the residents of the Indian subcontinent.

It is probably true that nobody can tell us, even approximately, what the herbal medicine industry means economically to the countries of South Asia. Without exaggeration it probably is well into tens of billions of dollars each year. The economic question is extremely important. It includes not only the sales or loss of sales because of illegal export, but also the large number of people involved in the harvesting, processing, and marketing of herbals. Besides the fact that such remedies provide basic health care they keep people in the workforce. Such people by the fruits of their labour purchase other goods and services that the rest of the economy produces and provides.

This renewable resource based industry can only survive if the plant resources are safeguarded and their use regulated and put on a sustainable basis. So far the issue has not received the attention and investment it merits. Huge gaps in the availability of information and data on the role of medicinal plants in the health care and economy of the region are the primary reason for their neglect by policy makers. As mentioned in the previous section in relation to the use of herbals there is a major gap in acquiring, collating and interpreting information and economic data (see table below).

What evidence do we have on the socio-economic importance of medicinal plants? How important are medicinal plants to people? How many people benefit from them? In what ways do they benefit? How are patterns of medicinal plant use and income generation changing? Micro-level research

conducted within the context of the larger macro-perspective can greatly illuminate the policy debate and contribute to the design of good policies and appropriate regulatory structures.

The Socio-Economic Research Agenda

In situ harvesting and ex situ production of medicinal plants

Data required:

- number of people involved in both activities
- tonnes material harvested
- monetary value of both production systems
- income received by workers

Processing and testing of medicinal materials

Data required:

- number of people employed
- income received
- number and volume of different medicines produced
- processing expenditures
- products value
- development costs e.g. toxicity testing, etc.

Marketing

Data required:

National level

- inventory of pharmaceutical companies
- volume of medicines in state/province in each country
- economic value of sales to state/province and national treasuries (potential value, extinction adjusted value)
- size of work force
- income received

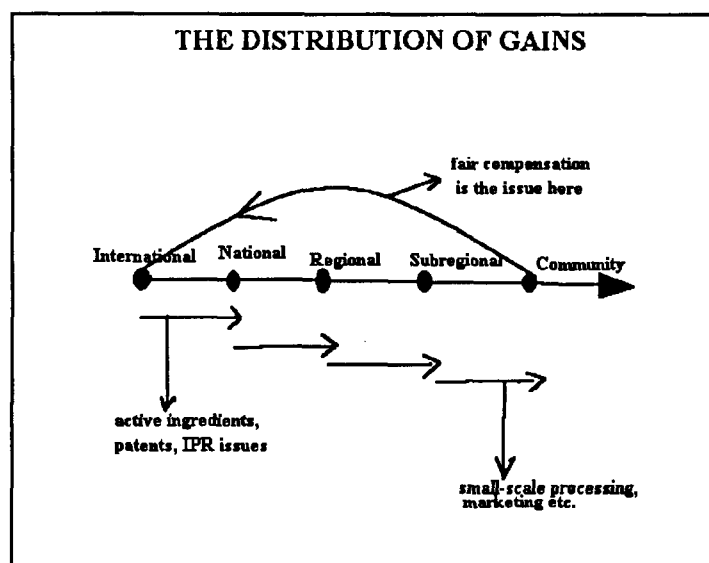
International

- number, volume and value of different medicinal plants exported
 - legally
 - estimate of illegal transactions

Highlighting the Key Issues

Putting People First

- The major concern is not merely how to develop medicinal plants for greater economic benefit but also equally critical is the issue of how to channel the gains to local people. There are two sides to this issue of fair distribution of gains - one, local communities must be fairly compensated for transfers of indigenous knowledge and material from them to the international economy and two, the capacities and ability of indigenous people and national economies to develop and use their natural resources for their own economic advancement and to increase their share of overall returns, need to be enhanced. Research capacity needs to be created across the board from the sophisticated, hi-tech, chemical and bio-technology end to devising appropriate field level technologies, if the direction of flow of benefits is to be effectively reversed.



- The sharp dichotomy between private sector commercial activities and public sector research and development activities has tended to undermine the potential of the latter for positively impacting upon the economic well-being of poor people. Recent times have seen a reappraisal of development strategies and the adoption of more commercial, enterprise based approaches to development initiatives as well as attempts to broker deals and collaborations between the private (for profit) sector and indigenous people. To what extent are these newer approaches viable? Theoretically at least there are several advantages and no dearth of possible win-win situations (see table).

THE GAINS FROM COLLABORATION BETWEEN COMPANIES AND COMMUNITIES

| What communities can contribute | What communities can gain |
|---|--|
| <ul style="list-style-type: none"> • knowledge • practical experience • early warning system on species and genetic erosion • improved quality and pace of screening • lower costs | <ul style="list-style-type: none"> • royalty income • employment • upgrading of technology • investment in resource management • infrastructure and social sector support |

- Is the theory borne out by practice or do the large income and power disparities between companies and people lead to unequal bargains? What lessons do the experiences to date provide? The claims made on behalf of two of the more publicized of these ventures are summarized in the box below.

The Merck - INBio Costa Rica Experience

- Merck is providing \$1.135 million for 10,000 extracts from biological accessions gathered by locally trained parataxonomists
- The partners have agreed to a royalty sharing agreement if any of the material or product is commercialized
- Significant employment has been created for Costa Ricans in the emerging field of biodiversity prospecting

The Shaman Experience

- About half of the 400 species collected by the company with community collaboration have shown some medicinal potential and two drugs are now under clinical trials
- Shaman's discovery costs are one-tenth of the cost of traditional laboratory techniques
- By working with community innovators, the efficiency of screening plants for medicinal properties has improved by more than 400%.
- Shaman arranges for charitable contributions to be returned to communities

- The question of channeling returns to the community is riddled with operational difficulties e.g. who should be compensated for traditional knowledge? How much compensation is fair recompense? What form should the returns take? Can existing local institutions be used or are new institutional forms necessary?

A Summary of the Discussions

There was a broad agreement that to maximize the socio-economic impact on the incomes and life of poor people involved in the various facets of the medicinal herbs economy it is important to adopt a market-led approach to the selection of R&D projects. There are several advantages to establishment of a close liaison between public sector institutions and the private sector, as a successful outcome to any development venture is dependent upon there being a demand for the product and its uptake by the private sector at the producer, trader and consumer levels. A good interface with the private sector can provide a better appreciation of the opportunities and constraints as well as safeguard against the research being too technology or supply-driven and against it going off on an academic tangent. Moreover, for those plants which have a significant established market demand but a threatened supply base it might be possible to get private sector support for research and developmental activities.

While the concept of better linkages between public institutions and the private sector was broadly endorsed, the issue of linking communities directly with commercial interests proved divisive and generated strong opposing views. Proponents of the approach felt that it was a significant departure from more traditional approaches to helping indigenous communities and increasingly the international development community would be called upon to play the role of the 'honest broker' and it should gear itself to this additional role by enlarging its research and expertise in the area of intellectual property rights; contracts; patents' and legal advice. Efforts such as those of Merck-INBio and Shaman were held to be first steps in the right direction, the flaws and inequities in the agreements subject to refinement with greater experience of these types of deals.

Objections to the concept were twofold. First were those based on scepticism as to how much local communities really stand to gain from such arrangements and whether they do not represent at best only a sort of 'tokenism' by large pharmaceutical interests and at worst publicity gimmicks to mislead and garner consumer support. Second, more serious objections were based on the view that such arrangements shift the focus of biodiversity conservation and management from local level utilization and local health care needs to 'biodiversity prospecting' type of activities emphasizing the search for new chemical and genetic materials and ultimately undermining the availability of low-cost, affordable health care.

In this context it was pointed out that the network's strategy of working with indigenous manufacturers producing traditional formulations seemed to have found a middle path. However, so far, the interface is limited to partnerships in research and to what extent the indigenous private sector is interested in direct arrangements with local communities to conserve key medicinal plant resources or for other kind of collaboration is open to question and could be explored further.

4. HEALTH SYSTEMS

Major Traditional Medical Systems

The term “traditional health systems” encompasses a large number of systems and practices. These are outlined in Satyavati (1982)¹ and essentially include the following:

- Ayurveda - widely practised in India, Pakistan, Sri Lanka, Nepal, Tibet, Mynamar and other countries.
- Siddha - a variant of Ayurveda being practised in parts of southern India.
- Unani Tibb or Greco-Arabian Medicine being practised in India, Pakistan, Bangladesh, Iran, the Middle East and a number of other countries.
- Yoga - practised for a long time all over India, Tibet, China and a few other countries and now popular in Western countries.
- Homeopathy - widely practised all over the world.
- Chinese, Tibetan and related systems of medicine.

Major Traditional Practices or Techniques

- Acupuncture - a significant contribution of Chinese medicine, along with its variants e.g. Japanese Shiatsu, Finger massages, etc.
- Naturopathy or Nature Cure including various techniques like Hydrotherapy, Magnetotherapy, Electrotherapy, Osteopathy and Psychotherapy.

1. G.V. Satyavati, 1982. "Some traditional medical systems and practices of global importance". *Indian Journal of Medical Research*, 76 (Suppl.) December 1982.

- Folk Medicine (including tribal medical practices) of different parts of the world.
- Herbal remedies of various countries.
- Marginal or Fringe Medicine-including faith healing, specialised therapies like treatment of snake bites (by drugs and charm); Tantric medicine including medico-religious practices in different parts of the globe; Occult medicine including astrology, para-psychology, hypnosis, etc.

Understanding of the unique features of the different systems and what they offer to their users, needs to be refined. Current debate veers between two extremes emphasizing either the provision of basic health care coverage to populations outside the reach of modern medicine or the ability of traditional systems to provide treatment and/or leads in the treatment of refractory conditions e.g AIDS, asthma, diabetes, malaria etc. for which modern medicine has unsatisfactory answers. In reality, traditional systems fulfil a variety of needs at a variety of levels and are used selectively and complementarily with the allopathic system by a significant section of the population. An examination of all the evidence available - scientific, historical and anecdotal - is necessary to put the use and role of traditional systems in the correct policy perspective.

Public health policy, in countries where such systems are in widespread use, needs to take into account the contribution of traditional medicine in maintaining the overall health of the population and to ensure that the viability of the systems is not eroded due to governmental neglect e.g. in safeguarding access to raw materials, maintaining appropriate standards, providing appropriate infrastructural support etc. The potential for integrated health care delivery systems needs to be explored further and the Chinese experience in this regard merits further discussion.

Highlighting the Key Issues

While local health traditions have an undeniably large and critical role to play vis-a-vis meeting the basic needs of poor people outside the ambit of modern medicine this fact should not mask the 'intrinsic' worth of these systems of knowledge. Many people quite simply prefer to use these systems regardless of questions of costs and access to modern medicine. Thus also, resurgence of interest in 'alternative medicine' is partly attributable to the drawbacks of modern medicine taking a reductionist approach to disease and often showing side effects and relatively high costs.

The more holistic, patient-centred approach of the alternative systems offers a platform for learning. For instance, a comparison of Ayurveda and allopathy can serve to highlight the potential for give and take and for exploring integrated health care delivery approaches (see table below):

| Ayurveda | Modern Medicine |
|--|---|
| <ul style="list-style-type: none">• Works on the whole body• Synergy of several herbs• For diseases of degeneration and chronic conditions• Minimal side effects• Works on body and mind | <ul style="list-style-type: none">• Attacks the infected system• Action of a single chemical• For infections and acute conditions• Side effects• Division psychic/somatic |

The following key issues emerged for discussion:

- How can we understand better the diverse systems of traditional medical care?
- What role can traditional health care systems play in the overall health systems of the countries concerned?
- Is it feasible or advisable to use Western scientific research methodologies to validate or evaluate traditional health systems?
- What are the national and international issues underlying research and resurgent interest in traditional health systems?

A Summary of the Discussions

The preventive and curative aspects of the contribution of the diverse traditional systems followed in the subcontinent - Ayurveda, Siddha and Unani as well as others have been inadequately studied and are inadequately reflected in the public health policies of the countries of the region. The neglect of these systems coupled with deforestation and reduced availability of herbals portends a significant attrition in the quality of life of many - reduced choice and reduced capacity to deal independently with common ailments and increased dependence on more expensive, external medical help.

China provides the only experience of the integration of the modern and traditional systems at the primary health care level. Both systems of medicine run side by side in the same hospitals offering patients a choice of therapy; sometimes doctors from different systems examine the patient together

and collectively determine what might be the best therapeutic option. Other innovations include the training of allopathic doctors additionally for two years in the traditional system. By and large, the approach seems to have worked at the primary level and has also created the atmosphere for more open-minded research and evaluation of traditional knowledge, leading to significant advances by the Chinese system of medicine.

The issue of whether or not it is feasible or appropriate to validate traditional health systems by Western scientific methods generated much discussion. The need for appreciation of the fact that different systems follow their own inherent logic and principles was highlighted and the limited utility and practicality of cross-validating one system by the other was stressed.

However, there is considerable potential for mutual learning and give and take between the different systems provided the need for equality, mutual respect and truly collaborative research is recognized. Multidisciplinary teams of allopathic and ayurvedic physicians along with pharmacologists, toxicologists and chemists can make significant contributions to the expansion of human knowledge and ability to tackle disease. The Indian Council of Medical Research initiated a Composite Drug Research Scheme which brought about some interaction between chemists, pharmacologists, pharmacognosists and specialists in the modern and the Ayurvedic systems of medicine. This supports several multi-centred clinical trials and clinical evaluation of selected plant preparations for selected conditions. The conditions selected by the Council are viral hepatitis, diabetes, bronchial asthma, anal fistula, urolithiasis and filaria.

Psychiatric disorders and neuro-degenerative diseases were highlighted as one potential area for collaborative research as well as for developing approaches towards integrated health care delivery mechanisms. Currently, brain related disorders account for the highest percentage of the population hospitalized the world over and synthetic drugs have only provided partial answers. Traditional systems with their greater emphasis on the social and psychological context of disease need to be drawn upon further. NIMHANS in India has already initiated collaborative research with Ayurvedic doctors. Such approaches should be pursued further.

Considerable concern was also voiced over the erosion of knowledge in Ayurveda and other traditional systems with its weakening transfer from one generation to the next. The need to distinguish those practices validated by long usage and well documented in the texts, from those which are not well-established was stressed.

Research and modern methodologies have a role to play in upgrading the status of traditional systems and ensuring their continued reach. So while the integrity and logic of the treatment system can be maintained, use of modern statistical methods for establishing clinical efficacy and of rigorous standardized training and quality control procedures should be encouraged to buttress the existing systems and ensure their survival in a changing world.

PROPOSALS FOR NETWORKING

5. RESEARCH PRIORITIES FOR THE NETWORK

Participants agreed upon a Mission Statement for the network as follows:

“The primary focus of the network is not to preserve the traditional systems of medicines per se, but to preserve and enhance the resource base of these systems, recognizing their value and their contribution to the well being of the people of South Asia”

Research priorities were agreed on the basis that traditional health systems play an important role in primary health care, affect biodiversity conservation and impact on economic growth. In South Asia more than 800 million people rely on such traditional systems for their primary health care. Within such a traditional health care system billions of dollars are exchanged annually through wages, purchase of crude plant materials, and the marketing and sales of processed drugs. At the same time the demand by the industrialized countries for plant materials is threatening the survival of an increasing number of species through legal and illegal transactions. Greater economic return would be received by the region if planned cultivation of some of these species could be undertaken and if such plant materials were processed in the countries of origin.

These activities cannot be treated in isolation, but should be designed to promote mutually reinforcing linkages between health care services, biodiversity conservation, utilization and management, and economic development.

The following seven areas were identified as priority research areas:

I. Medicinal Plant Data Base and Inventory

Many of the medicinal plants are gathered from forest ecosystems. These wild resources are declining rapidly due to over exploitation, legal and illegal, to meet the high market demand. Because of the absence of any organized (national and/or state) systematic collecting procedure an increasing number

of medicinal plants are endangered and/or threatened. A first step should be to gather data on a country basis to:

- i. Inventory known medicinal plants in the region. This will require data obtainable from State/ Provincial and National Ministries, universities, herbaria, etc. Such a composite regional checklist could feed into the Biodiversity Map Library developed by the World Conservation Monitoring Centre (WCMC). It could be the basis for initiating a global medicinal plant library and provide an additional source of information to national and international agencies for biodiversity appraisal and general environmental assessment.²

II. Wild Germplasm Collecting and In Situ Conservation

There is an urgent need to identify a system that allows for the collecting of wild germplasm and provides the means for in situ conservation. There is a need for the following:

- i. Research on strategies for in situ conservation
- ii. Identification and collation of the knowledge of indigenous and local peoples on such resources and its incorporation into strategies for sustainable utilization.
- iii. The development of education/training packages for collectors, traders and practitioners that clearly outline the current status of these resources and the urgent need for their protection and details how through collective management use may become sustainable.
- iv. Assess the effectiveness of the current distribution of protected areas in covering medical plant biodiversity.
- v. Maintain an overview of policies and practices of countries in the region. Since medicinal plant biodiversity is to a great extent shared regionally between the countries a congruence of conservation strategies and trade legislation would be required. Ultimately this should lead to the formulation of regional conservation strategies and acceptance of a common set of guidelines and principles.

III. Medicinal Plant Selection, Cultivation and Ex Situ Conservation

- i. Prioritization of species for research would constitute an essential first step in strategy definition. About 500 species form the therapeutic core of the traditional systems of medicine
2.

WCMC Geographical Information System (GIS) mapping unit supports GIS technology in Sri Lanka, Bangladesh and Nepal besides having a Regional Centre in India.

in the region. To put together a viable strategy for ex situ conservation a narrower subset of 30-50 species needs to be arrived at. Such a prioritization exercise would need to take into account health care priorities, trade and usage statistics, threatened/ endangered status and a variety of other parameters and would need to be based on a broad consultation and validation process involving expert opinion and a wide range of interest groups - e.g. national conservation and environmental agencies, local communities, traders, exporters, indigenous practitioners and manufacturers.

- ii. Based on the priority species, on existing activities and known supply/ demand patterns, a limited number of species should be targeted for domestication and cultivation in a range of agrosilvicultural systems. Such research on cultivation systems would need to be complemented by appropriate research on economic viability, pricing and marketing issues. Appropriate cultivation systems will include a range of types ranging from use as hedges to small plantations.
- iii. Currently medicinal plant resources are a long way from being genetically enhanced except in very few cases (e.g. research sponsored by the Indian government). There is inadequate knowledge to guide a program of selection and breeding with evidence showing that active principles vary widely from source to source. Patterns of variation need to be studied and the genotype-environment interactions affecting active principles need to be understood better. Local knowledge should be a first step in the selection of genotypes.
- iv. Subsequent research on species with a high economic potential would include vegetative propagation, building a genetic resource base, and evaluation trials leading to genetic enhancement.

IV. Policy Issues

Several areas of public policy emerge where the network could meaningfully focus attention and stimulate research, dialogue and reappraisal of policies. The key areas meriting attention were identified as public health policies, intellectual property right regimes, the trade in endangered species and the need for regional collaboration to effectively conserve medicinal plant resources:

- i. Public health budgets in many developing countries tend to follow the 80:20 rule, with 80% of resources being spent on modern medical systems which reach only about 20% of the population. Public health policy needs to take greater cognizance of the role of traditional systems and aim at a deployment of resources which maximizes health coverage and services per unit investment. The answers on what the optimal allocation of resources may be are by no means straightforward as a large part of the superior reach of traditional practitioners is explained by their autonomous, small-scale, dispersed and decentralized operations. Drawing

them too closely into the net of public health services may prove counter-productive. However, policy attention and public investment are undeniably needed vis-a-vis the safeguarding of the resource base of the sector and providing it with adequate infrastructure and administrative support for conducting research, maintaining the quality of teaching and training facilities, upgrading of technologies and maintaining standards.

- ii. Although the world market value of medicines derived from plants used in traditional medicine systems exceeds \$43 billion, less than 0.01 per cent of the profits have gone to the indigenous people who led researchers to them. Due cognizance of the policy dimensions of safeguarding the interests of local communities is needed. Putting in place mechanisms to channel returns to them is also necessary as well as and to guarantee continued access by local users and communities to endemic medicinal plant resources. It is recognized that such action is part of a broader response to the Convention on Biological Diversity and the network is asked to maintain a watching brief in this area.
- iii. Existing legislation regarding standards for the processing of medicinal plant products throughout the region need to be reviewed and devising incremental strategies for an upward revision of standards based upon improved procedures and technologies should be followed.
- iv. Legislation and mechanisms promoting the protection, exchange and/or access to plant genetic resources need review. Additionally, for key medicinal plant species attention needs to be drawn to the benefits of congruence of conservation strategies across the South Asian countries. The Convention on Biological Diversity and policies of a number of international organizations are also involved with germplasm issues and the network will need to work within the framework of suitable protocols which are government responsibilities.

V. Socio-economic Research

Huge gaps in the availability of data regarding the role of the traditional medical and medicinal plants sectors in the health care and economy of the region contribute to their neglect by policy makers. The network is in a unique position to initiate and undertake the task of collecting and compiling data that will provide estimates of the social and economic impact of the traditional health care systems to the countries and the region. Such an exercise would require information and input from a multiplicity of sources - tribal/indigenous/local people, universities, herbaria, herb suppliers, industry/manufacturers, dispensaries, and practitioners. Establishing a procedure for cooperation and coordination would be the first step in a regional network for a system of information exchange.

The broad parameters to be covered were agreed upon as follows:

- economic and health benefits derived from traditional health care activities and the relative cost

effectiveness of the traditional system vis-a-vis the state/province and national markets in providing health care

- % and value of medicinal plant production of the agricultural and forestry sectors
- % and value of traditional herbal medicines of health budget
- numbers of people employed
- income received
- estimated number of jobs lost due to illegal export of medicinal herbs i.e. Nepal to India, India to Europe
- estimate of number of jobs and income lost due to the export of crude plant material vis-a-vis semi-processed and processed

VI. Integrated Health Care Delivery Systems

Public health policy needs to take into account the contribution of traditional medicine in maintaining the overall health status of the population and to ensure that the viability of these systems is not eroded due to governmental neglect, e.g. in safeguarding access to raw materials, maintaining standards, providing infrastructural support etc. A focus on the following is needed:

- i. There is a need to identify the most serious and widely prevalent diseases and the plants used in their treatment under traditional systems for primary health care. Two possible approaches³ exist: one plant per disease or one plant as a component in many herbal preparations. This area of research will impact on III i above.
- ii. Multidisciplinary teams of allopathic and ayurvedic physicians along with pharmacologists, toxicologists and chemists can make significant contributions to the expansion of human knowledge regarding medicinal plant diversity and its potential to tackle disease. The scope for integrated health care delivery systems needs to be explored further and the design and conduct of collaborative research

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3. The latter approach has been used in the Arya Vaidya Sala - IDRC project (see Network Research - an illustration). The former approach (i.e. prioritization of plants on the basis of primary health care priorities) needs to be developed further and used in the design of research programs on medicinal plants. Currently a total of 26 species are being researched upon under the network (see Network Research - species under investigation) based on a variety of criteria - use by indigenous manufacturers, tribals and local collectors, endangered status etc.

encouraged. Sharply focused, multi-centred clinical trials and clinical evaluation of selected plants for selected conditions along with the use of modern statistical methods for establishing clinical efficacy could be supported on a limited basis. While the primary focus of the network is based upon natural resources rather than health per se this area of research is considered important to the achievement of the overall objectives. It is necessary to buttress the existing systems, keep their knowledge traditions dynamic and growing and ensure their survival in a changing world.

iii. Public health demands continual vigilance especially when new processing methods become available. There are ethical reasons to extend the same to herbal remedies to ensure that supplies to ever increasing populations, especially in urban areas, are from identifiable and reliable sources, are free from contamination during collection, processing and storage, and that dosages are clear to avoid unnecessary toxicities. This is discussed in detail below.

VII. Storage, Processing, Standardization and Quality Control

There is a large store of indigenous knowledge and a long tradition of health care provision based on the utilization of local biodiversity which needs to be preserved and built upon systematically. There is an urgent need to go beyond current isolated interest in documenting the huge store of knowledge, to impose a rigorous scientific approach and to use the latter in ensuring delivery of quality herbal preparations to address primary health care needs. Currently, the use of this resource base is constrained by lack of standards at all levels, from collecting plant materials to the local sale of processed materials. Popular remedies are in short supply and there is widespread substitution and adulteration. More importantly most of the remedies used have not been subjected to scientific analysis and this failure to bring these systems into the mainstream of scientific research and knowledge could result in the complete loss of this knowledge through its gradual erosion and displacement in use.

R&D on some high priority herbal preparations in relation to efficacy, safety, and development of standards for collecting storage, processing, production for pharmaceutical use, dosage and shelf-life as well as working with existing indigenous enterprises and initiation of micro-level processing units feeding into the domestic industry were identified as related areas of network research. The following are aspects of this research:

i. Standardization: It was felt that standardization may hold the key to further advances in this area and substantive research needs to be carried out on this aspect. Many potential hazards would be reduced if standard preparations became extended more on the basis of quality control and the preparation of standard doses.

ii. Quality Control: The technology currently available is not able to develop suitable quality control criteria for crude extracts, decoctions and compound formulations typically used by traditional

practitioners. Sizeable resources and research attention need to be committed to developing methodologies to enhance quality.

iii. Establishing Efficacy: So far testing of efficacy or therapeutic activity has tended to ignore completely the fact that traditional medicine lays a lot of emphasis on the manner in which the plant part is administered with therapeutic activity resting in the particular combination of compounds/formulations involving several herbs/ ingredients. Research needs to be directed at developing better methods based on a more complete understanding of traditional practices.

iv. Storage: Modern day, large scale processing of herbal formulations necessitates the storage of plant raw materials over extended periods of time. Research is needed to identify changes in chemical composition during storage and to establish to what extent there are losses in product quality and efficacy during storage. Improved storage techniques, pre-treatment and partial processing to inhibit losses are areas requiring further study.

v. Processing: The development of small scale, affordable and appropriate technologies geared towards local-level value addition that can utilize existing resources and labour (especially women) and improve returns to gatherers (and at the same time reduce costs of transportation and storage) are also an important research area.

FINAL NOTE

Since considerable resources would be needed to undertake the above research agenda it was agreed that the network should attempt to augment its existing financial resources by seeking grants, collaborations and co-funding arrangements with other agencies and donors.



Dr. P.K. Warrier lighting the inaugural lamp. Watching on are Cherla Sastry and K.K. Nair in the foreground and J.T. Williams, A.V. Rao, Vijayalakshmi Ravindranath and L. Arambewela in the background



From L to R J.T. Williams, A.V. Rao, V. Ravindranath, K.K. Nair, John Lambert, L. Arambewela, D.K. Ved, M.I. Zuberi, R. Shrestha and S. Sitaraman



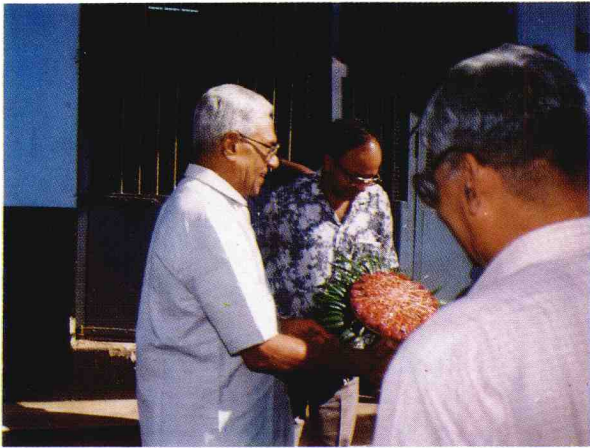
From L to R Keith Shawe, P.K. Warrier, Cherla Sastry and Manjul Bajaj



J.T. Williams



Keith Shawe and John Lambert



Dr. Warriar welcomes participants to Arya Vaidya Sala



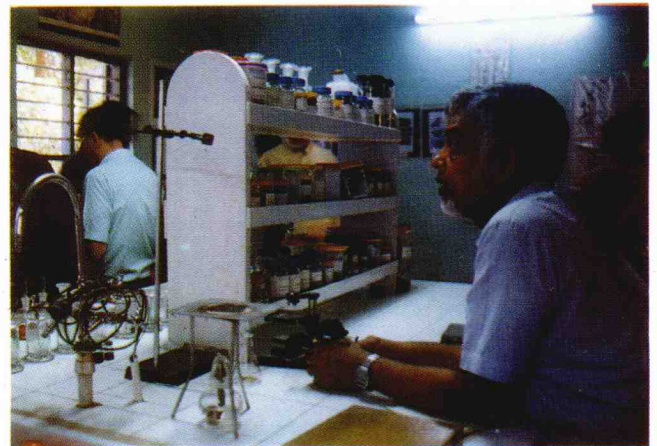
From L to R Anita Paul, Arun Chandan, V.S. Murty, D.K. Ved, V.P.K. Nambiar and A.V. Rao



Participants sitting down for a traditional Kerala meal during the field trip.



Seen in this picture are Anita Paul, S. Vedavathy, V.P.K. Nambiar, J.T. Williams, S. Sitaraman, J. Lambert, V.S. Murty, D.K. Ved and A.D. Karve



A.V. Rao at the Arya Vaidya Sala quality control laboratory

6. CODE OF CONDUCT ON MEDICINAL PLANT RESEARCH

The participants agreed upon a code of conduct which should guide the network operations.⁴ It was noted that this will be of value to other organizations and agencies.

PREAMBLE

The participants of an IDRC-sponsored meeting on Medicinal Plants Research, in Calicut, India, 6-8 February, 1995 have noted that:

Whereas plants have been the source of foods and medicines throughout history, and;

Whereas traditional systems of medicine have employed medicinal plants for primary health care purposes, and

Whereas approximately 80% of the world's population is dependent upon traditional and folk systems of medicine for primary health care, and

Whereas an increasing number of medicinal plants are being approved by governments in developed and developing countries for use in primary health care delivery systems, and

Whereas there is a great need to increase awareness of the value of medicinal plant bio diversity and associated knowledge and

Whereas the supply of medicinal plants in the South Asian region, combined with absence of standards for crude drugs result in commonplace adulteration and substitution, and

Whereas there are at least 55,000 licensed pharmacies and companies utilizing medicinal plants, and

Whereas many traditional herbal medicines are relatively low in cost,

And agreed as follows:

4. A number of texts listed at the end were used to initiate discussion and reach the agreement presented here.

ARTICLE 1 Origin of medicinal plant materials

Plant materials will be properly documented with respect to plant identity and location of source.

ARTICLE 2 Collecting material and quality specifications for fresh, dried and processed plant materials

In view of the existing over-exploitation of many medicinal plants, standards will be agreed for collecting material of each species. Standards will relate to part of plant collected, stage of development and timing of collecting. As far as possible these standards will accord with authoritative publications.

All aspects of processing will accord with agreed procedures and be related as far as possible to authoritative texts. These aspects will include storage of plant, time of processing and methods (solvents, heat etc.) including equipment, standards of cleanliness to reduce microbial contamination and storage of extracts. Limits of other plant parts in addition to the target plant part will be set, as will the limits for foreign mineral matter. Where such standards or procedures are not widely documented they will be developed through research.

ARTICLE 3 Characterization of therapeutic value and information on use and constituents

All research on herbal medicines must specify the documented accepted value of the plant-derived material in human health benefits.

Dosages, i.e. form (powder, decoction etc.), amount, and timing of dosage will be documented with specific details of processing and preparation. Forms of preparation relate to one or more of powdered plant materials, extracts, purified extracts or partially purified active substances isolated from plants. Routes of administration are also to be documented.

Active constituents, as far as they are known, should be stated and their structural formulae given. However, in many cases, the plant preparation as a whole is therapeutically effective even though active principles are not known. Such 'crude' preparations are recognized as useful and documented in texts because activity may depend on a large number of components.

In single plant remedies contents of known therapeutically active constituents should be determined and acceptable dosage range specified for the health systems in which the remedy is used. When the medicine is a herbal mixture, the most characterizing compounds should be described.

ARTICLE 4 Documentation of therapeutic uses

Documentation of therapy for specific diseases and maladies should include status of use of medicinal plants in therapy (in the past, current, or changes proposed), and also adjunct therapies, such as diets, life style modifications, baths, psychological or ritual treatments.

Disorders treated may include folk terms and maladies which are culturally defined.

Data on therapy should be supplemented by criteria for diagnosing the disease or malady and also by relating the therapy to the stage of the disease.

ARTICLE 5 Toxicity of herbal medicines

It is recognized that toxicological investigations are required to supplement human experience in defining possible toxicity of herbal preparations. Where this is not documented in authoritative texts, the WHO research guidelines are appropriate.

ARTICLE 6 Clinical trials

Clinical trials are used to validate efficacy, to develop new medicines, to revise dosage formulations and to test activity of extracted, purified or crude compounds. In this respect the WHO research guidelines are appropriate.

ARTICLE 7 Pharmacological studies of herbal medicines

Non-clinical studies may be required to determine whether the clinical use of a herbal medicine is valid, to characterize the range of pharmacological actions or to understand more about pharmacologically active products/compounds. In this respect the WHO research guidelines are appropriate.

ARTICLE 8 Availability of plant material

Relevant government agencies will be informed of any networking involving bilateral agreements where research and materials are to be conducted and made available across national boundaries. Access to materials will be on mutually agreed terms to accord with Article 15 of the Convention on Biological Diversity.

In the event that international concerns express interest in bio-active agents identified during network research, equitable partnerships will be developed to accord with any relevant national law and the Convention on Biological Diversity so that positive input in economic terms can be made to conservation and establishment of local production of herbal medicines.

ARTICLE 9 Indigenous knowledge

The network recognizes that traditional use of a herbal medicine is usually a part of culture. Folklore and traditional knowledge should be an integral part of research planning, such knowledge should be respected, acknowledged and interpreted when research proposals are developed. Communities which provide such knowledge should be involved with research objectives, research planning and be informed of the results generated.

ARTICLE 10 Sustainability of plant resources

Where collecting plant material results in destruction of the plants, guidelines need to be developed to assure regeneration.

Where plant resources are rare in nature, over-exploited in specific areas, or otherwise undergoing genetic erosion or population fragmentation from any cause, the network will pursue research to bring suitable genotypes into cultivation to provide reliable and sustainable sources of material.

This Article accords with article 10 of the Convention on Biological Diversity and Chapters 15 and 32 of Agenda 21.

ARTICLE 11 Other ethical considerations

A number of other ethical considerations impinge on research. The network recognizes the following principles :

- i. Research planning has to differentiate between herbal medicines which have a well-documented background from long usage and those where traditional usage is unclear and not well-documented.

In this respect questions of safety and efficacy arise. Plants which are both effective and non-toxic in a particular treatment can be promoted for wider use for that treatment, but promotion of those which are toxic, as currently used, is unethical.

- ii. The promotion of plants which are sanctioned as non-toxic but lack sanctioning as effective may occur where significant numbers of people exist who can have access to such plants but lack alternative treatments, documented and known to be effective.
- iii. Plant remedies not sanctioned to be non-toxic will not be promoted. However, research can be pursued on them with a view to identifying safe limits. This principle can be applied to

diverse sources of the same species which vary in their active principle contents and where use in therapy can be queried on safety grounds.

- iv. Provided that no plants are known, or suspected to be, toxic, the promotion of multiple plant preparations - where one or more is not sanctioned as non-toxic - is ethical only in situations where reasonable and known-to-be-safe alternatives do not exist and where research is underway to determine the safety of the non-sanctioned plant.
- v. Where research involves human beings it will be conducted in accordance with principles of respect for persons, justice, benefit, and lack of maleficence.
- vi. Promotion of any herbal remedy through the network will accord with required regulatory mechanisms in the country and will only be deemed allowable if concepts of equity and sustainable development are taken into account.

TEXTS USED IN FORMULATING THE AGREEMENT

- WHO International Symposium on Medicinal Plants held at the Morris Arboretum, PA, USA 19-21 April, 1993.
- Proceedings of an International Workshop, IDRC, Ottawa, Canada, 2-4 March, 1994.
- WHO Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines, 1993.
- Communication to IDRC-SARO from the Ethics Committee of IDRC, Ottawa, November 1994.

7. IDRC ETHICAL REVIEW GUIDELINES

The network operates under the auspices of IDRC Canada. IDRC had provided some ethical review guidelines. They were shared with members of a working group and briefly reviewed. Those representing agencies already cooperating in the network research had some experience with applying the guidelines and were able to discuss these with the larger group. The discussion concluded with a three point resolution, ratified by the plenary meeting, to be conveyed to the IDRC Ethical Review Committee:

1. It is generally agreed that medicinal plant research is a sensitive area of enquiry and impinges upon a large number of ethical and moral concerns. In this context the decision of IDRC to subject proposals in this field of research to an ethical review process is well taken and appreciated.
2. However, the list of sanctioned texts presently attached to the guidelines by IDRC Canada does not contain references applicable to Indian and related systems of medicine - only Western and Chinese texts. These texts are not readily available to South Asian researchers and moreover, in most cases, do not contain information on plant species relevant to the region. The group, therefore, recommends that select authoritative references from the region should be added to the present list when reviewing proposals from the region (See below for texts recommended).
3. Given the rapid rate of loss of biological diversity and the urgent need to preserve it and given also the fact that so far only 5% of the plants known to have medicinal uses have been studied for their biochemical/biologically active properties, the group recommends that IDRC remove from the question of ethics, as they apply to human health, activities that support conservation and management of useful plant resources. Since the risk to health is not in promoting a plant perse (e.g. its cultivation or harvest or conservation), but in encouraging plant-use combinations

it is suggested that a more limited definition of “promotion” **as encouraging the use of a particular plant (or plant mixture) - to treat or prevent a particular condition of health** may be used. While the issue under discussion is complex, it is felt that, on balance, discouraging conservation efforts for want of complete scientific validation of usage will do more harm than good .

References: Indian/ Related systems

1. *Indian Medicinal Plants*, Vol.1-3 (1995) Arya Vaidya Sala, Orient Longman Limited, Hyderabad, India.
2. *Indian Medicinal Plants*, Vol. I-V (1935) by B.D Basu and K.R Kirtikar, published by Lalit Mohan Basu, Allahabad, India.
3. *The Indian Materia Medica* (1954) by K.M. Nadkarni, Popular Prakashan, Bombay, India.
4. *Medicinal Plants of India*, Vol. 1 and 2 (1987) by Satyavati *et al*, Indian Council of Medical Research, New Delhi, India.
5. *Medicinal Plants used in Ceylon*, (1982) by D.M.A. Jayaweera, National Science Council of Sri Lanka, Colombo, Sri Lanka.

FACTS AND FIGURES

I-ABOUT THE NETWORK RESEARCH

1. AN ILLUSTRATION

TOWARDS A FOCUSED, USER DRIVEN BIODIVERSITY CONSERVATION STRATEGY - An illustration from the IDRC Network project with Arya Vaidya Sala, Kerala

The IDRC Medplants Network has defined for itself a user based, biodiversity conservation strategy. Currently in place are a series of eight linked projects over four countries which are targeted at undertaking research in partnership with the existing users of the resource base. A special effort has been made to draw in the indigenous, private sector in defining research priorities and undertaking research. The Arya Vaidya Sala at Kottakal offers an example of the approach. The institution is about a hundred years old and combines the multiple facets of the traditional medicine sector - a family based, hereditary knowledge tradition, hospital and teaching facilities, manufacturing and R&D work - within its structure. Based on its own usage statistics and experiences with declining availability of plant materials, the Arya Vaidya Sala prioritized the following ten species and in collaboration with IDRC is engaged in a comprehensive programme aimed at mapping natural stocks, developing ex situ and farmer based cultivation strategies and investigating the therapeutic action of these species.

Baliospermum montanum (27; 1000)
Celastrus paniculatus (15; 540)
Coscinium fenestratum (70; 3300)
Crataeva rurvata (13; 1840)
Embila ribes (75; 3030)
Hemidesmus indicus (30; 19000)
Holostemma ada-kodien (40; 3860)
Rubia cordifolia (40; 4200)
Saraca asoca (3; 5310)
Trichosanthes lobata (32; 5800)

(Figures in brackets are the number of ayurvedic medicines in which the species are utilized and their quantity in kg. used by Arya Vaidya Sala in 1991-92) - *Courtesy Prof. V.P.K. Nambiar, Arya Vaidya Sala, Kottakal.*

2. A BRIEF PROFILE OF PARTNERS

Arya Vaidya Sala (AVS) Kottakal, Kerala, India is well known in India and outside for the high quality of drugs produced in its manufacturing unit; effective treatment given in its charitable hospital and nursing home; high standard of education imparted in its college; soundness of applied research carried out in its R&D laboratory and authenticity of publications released by its Publications Wing.

Asia Network for Small Scale Agricultural Biotechnologies (ANSAB) is a private non-profit, non-political, and non-sectarian international organization with Headquarters in Nepal, jointly sponsored by the Government of Nepal and Appropriate Technology International of Washington, D.C. with the intention of meeting the needs for institutional arrangements to develop concentrated endeavour in the Asia region for improvement of the ecological and economic conditions of resource-poor farmers through the promotion of agricultural biotechnologies

The Ceylon Institute of Scientific and Industrial Research (CISIR) is a national multi-disciplinary research and development organization in the Ministry of Industries and Scientific affairs set up with the objective of developing industries. It has a strength of 50

research officials and 70 technical assistants and has close links with industry, universities and research institutions in Sri Lanka. The Natural Products division of the institute carries out agronomical and phyto-chemical studies on medicinal plants. Quality control of Ayurvedic drugs, testing and consultancy services to industry are other functions of CISIR

The Centre of Application of Science and Technology for Rural Development (CASTFORD), India, was established in Pune to serve the rural population through the vehicle of modern science and technology. The areas in which CASTFORD has generated new rural technologies comprise rural energy, population control, plant tissue culture, medicinal plants, modern nursery techniques, domestication of wild plant species, silvicultural methods, hydroponic culture, drought hardening of plants etc. Several of the technologies are already being used on a commercial scale.

Centre for Environmental Research (CER) was founded by a group of teachers under the leadership of Prof. M.I. Zuberi of the University of Rajshahi, Bangladesh. Its main objectives are: to organize and conduct inter-disciplinary research on the physico-biotic and socio-eco-

nomic aspects of environments; to create laboratory facilities, inventory materials and literature on environment, its degradation, pollution and preservation; to organize seminars, symposia to create awareness of the importance of protecting and preservation on environment; to establish linkages with other national and international organizations, departments, institutions and research workers in the field to facilitate exchange of materials and ideas on the subject.

Society for Environmental and Rural Awakening (ERA) is an NGO based in the Western Himalayas in India. The Society is headed by an Ayurvedic physician and has a dedicated team of 20 workers concentrating on various facets of improving the quality of life in the hills - wastelands development, appropriate technologies, organization of women's groups, health and hygiene.

Foundation for Revitalisation of Local Health Traditions (FRLHT), India, is a public trust created with a mandate of playing a pioneering role in medicinal plants conservation. The Foundation has helped establish 30 medicinal plants conservation areas in South India and is promoting a production unit which will manufacture herbal medicine through tribal co-operatives. The Foundation's research department

has already formulated a threatened medicinal plants list along with a list of priority plants based on realistic criteria. Ongoing work includes nomenclature and eco-distribution mapping of priority plants of South India and establishment of nursery techniques for selected wild medicinal plants.

Indian Institute of Science (IISc) is an autonomous Institute supported by the Ministry of Human Resource Development. It is one of the oldest Institutions in the country, mainly devoted to basic research and training through Engineering and Science. The institute has Ph.D. programmes in various disciplines of Science. The division of Biological Sciences has excellent facilities to undertake basic and applied research. The institute has a consultancy centre which interfaces with industry and facilitates transfer of technology.

The Indian Council for Forestry Research and Education (ICFRE) is an organization mandated by the Govt. of India to organize, direct and manage forest research and education in the country. There are eight research institutes and one advanced centre under the Council. Each institute/centre is headed by a Director, assisted by senior staff responsible for research programmes facilities and administration.

The Natural Resources Institute (NRI) is a scientific centre of Britain's Overseas Development Administration (ODA). The Institute has a world-wide reputation for its expertise on renewable natural resources in developing countries. Its principal aim is to alleviate poverty and hardship in these countries by increasing the productivity of their renewable natural resources through the application of science and technology.

The National Institute of Mental Health and Neuro Sciences (NIMHANS) is an autonomous institute under the 'Ministry of Health and Family Welfare' of the Govt. of India. The major goals of the institute are to provide clinical services and training and to carry out research in the area of mental health and neurosciences. The institute has a full-fledged hospital (800 bed) for treatment of patients in Neurology, Neurosurgery and Psychiatry and excellent infrastructural facilities for research in neurosciences.

Pan Himalayan Grassroots Development Foundation was established in 1992 with the primary motive of initiating peoples action at the grassroots for restoration of languishing watersheds through integrated mountain development. Since its inception the Outreach Programme Office, located outside Ranikhet, has

been actively involved with promotion of self-reliant local bodies and assisting them with various intermediate technology applications.

Sri Venkateshwara Arts College is run by Tirumala Tirupati Devasthanam (a temple Trust responsible for the management of a very important Shrine and place of worship in South India) and affiliated to the Sri Venkateswara University, Tirupati which is a locally well respected institution. The College's medicinal plant research is based around the sacred groves of the Tirumala hills.

The Vittal Mallya Scientific Research Foundation (VMSRF) is a private organization engaged in frontline research in biotechnology, chemistry of natural products, energy efficient organic reaction, enzyme catalysis and health care. The Foundations laboratories are well equipped with sophisticated instrumentation and backed up by a modern library.

Venkateswara Ayurveda Nilayam (Pvt) Ltd., India, was founded by Vidwan D. Venkateswarlu in 1925 with the aim of giving the best ayurvedic diagnostic and treatment services available. The service network has grown tremendously since then, with 80 authorised depots throughout Andhra Pradesh and manufactures more than 200 Ayurvedic Medicines.

3 . SPECIES UNDER INVESTIGATION

| NAME OF PLANT | RESEARCH ASPECTS | RESEARCH INSTITUTION |
|------------------------------------|--|---|
| 1. <i>Baliospermum montanum</i> | Mapping natural stocks, developing ex situ and farmer based cultivation strategies and investigating therapeutic action. | Arya Vaidya Sala (AVS), Kerela |
| 2. <i>Celastrus paniculatus</i> | | |
| 3. <i>Coscinium fenestratum</i> | | |
| 4. <i>Crataeva rurvata</i> | | |
| 5. <i>Embila ribes</i> | | |
| 6. <i>Hemidesmus indicus</i> | | |
| 7. <i>Holostemma ada-kodien</i> | | |
| 8. <i>Rubia cordifolia</i> | | |
| 9. <i>Saraca asoca</i> | | |
| 10. <i>Trichosanthes lobata</i> | | |
| 11. <i>Taxus baccata</i> | Nursery techniques and cultivation package. | Indian Council of Forestry Research & Education (ICRFE) Dehra Dun |
| 12. <i>Nordostachys jatamansii</i> | | |
| 13. <i>Picrorhiza kurroa</i> | | |
| 14. <i>Colchium luteum</i> | | |
| 15. <i>Cassia angustifolia</i> | Low-cost vegetative propagation techniques. | Centre for Application of Science and Technology for Rural Development (CASTFORD), Pune |
| 16. <i>Mappia foetida</i> | | |
| 17. <i>Terminalia bellerica</i> | | |
| 18. <i>Terminalia arjuna</i> | | |
| 19. <i>Terminalia chebula</i> | | |
| 20. <i>Carica papaya</i> | To carry out etho-botanical survey on birth control usage by the indigenous tribes of Chittoor District (Andhra Pradesh) | Sri Venkateshwara Arts College Tirupati |
| 21. <i>Ferula asafoetida</i> | | |
| 23. <i>Moringa oleifera</i> | | |
| 24. <i>Plumbago zeylanica</i> | | |
| 25. <i>Citrullus colocynthis</i> | | |
| 26. <i>Azadirachta indica</i> | Economical methods to extract and separate azadirachtin, the most important active principle in neem and other fractions which have insecticidal medicinal and immuno-modulatory properties. | Vittal Malla Scientific Research Foundation (VMSRF) |

II - THREATENED SPECIES

THREATENED MEDICINAL PLANTS OF BANGLADESH

| Name of Plant | Family | Status (to be confirmed) |
|---------------------------------|----------------|--------------------------|
| <i>Andrographis paniculata</i> | Acanthaceae | Population threatened |
| <i>Ocinum sanctum</i> | Labiatae | Population loss |
| <i>Centella asiatica</i> | Umbelliferae | Habitat shrinkage |
| <i>Adhatoda vasica</i> | Acanthaceae | Rare |
| <i>Datura metel</i> | Solanaceae | Habitat destruction |
| <i>Coccinia cordifolia</i> | Cacurbitaceae | Germplasm erosion |
| <i>Mimosa pudica</i> | Mimosoideae | Habitat destruction |
| <i>Nerium indicum</i> | Apocynaceae | Germplasm erosion |
| <i>Salmaia malabaricum</i> | Bombacaceae | Reduced population |
| <i>Calotropis procera</i> | Asclepiadaceae | Habitat loss |
| <i>Mucuna pruriens</i> | Papilionaceae | Rare |
| <i>Tragia involucrata</i> | Euphorbiaceae | Rare |
| <i>Achyranthes aspera</i> | Amaranthaceae | Habitat destruction |
| <i>Boerhavia repens</i> | Nyctagivaceae | Habitat destruction |
| <i>Paederia foetida</i> | Rubiaceae | Rare, habitat loss |
| <i>Gloriosa superba</i> | Liliaceae | Very rare |
| <i>Melia azadirachta</i> | Meliaceae | Over extraction |
| <i>Vitex negundo</i> | Verbenaceae | Habitat destruction |
| <i>Aegle aaralos</i> | Rutaceae | Germplasm erosion |
| <i>Abrus precatorius</i> | Leguminosae | Very rare |
| <i>Alangium salviifolium</i> | Alangiaceae | Very rare |
| <i>Butea monosperma</i> | Leguminosae | Very rare |
| <i>Raulfia serpentina</i> | Apocynaceae | Endangered |
| <i>Terminalia belirica</i> | Combretaceae | Endangered |
| <i>Terminalia aurjuna</i> | Combretaceae | Endangered |
| <i>Terminalia chebula</i> | Combretaceae | Endangered |
| <i>Phyllanthus anblia</i> | Euphorbiaceae | Very rare |
| <i>Holarrhena antidysentica</i> | Apocynaceae | Habitat loss |
| <i>Ricinus communis</i> | Euphorbiaceae | Germplasm erosion |
| <i>Acalypha indica</i> | Euphorbiaceae | Habitat loss |
| <i>Asperagus racemosus</i> | Liliaceae | Habitat loss |
| <i>Alstonia scholaris</i> | Apocynaceae | Habitat destruction |
| <i>Euphorbia hirta</i> | Euphorbiaceae | Habitat destruction |
| <i>Saraca indica</i> | Caesalpinieae | Over exploited |
| <i>Tinospora cordifolia</i> | Menispermaceae | Habitat loss |
| <i>Pedaria foetida</i> | Rubiaceae | Habitat loss |
| <i>Bryophyllum calycinum</i> | Crassulaceae | Habitat loss |
| <i>Cassia fistula</i> | Caesalpinia | Habitat loss |

Source: Centre for Environmental Research, University of Rajshahi, Bangladesh - Courtesy Prof. M.I. Zuberi.

THREATENED MEDICINAL PLANTS OF INDIA

| Name | Present Status |
|---------------------------------|-------------------------|
| <i>Aconitum deinorrhizum</i> | Almost extinct |
| <i>A. heterophyllum</i> | Greatly threatened |
| <i>Angelica glauca</i> | Threatened |
| <i>Arnebia benthemii</i> | Threatened |
| <i>Artemisia brevifolia</i> | Likely to be threatened |
| <i>A. maritima</i> | Likely to be threatened |
| <i>Atropa acuminata</i> | Threatened |
| <i>Berberis aristata</i> | Threatened |
| <i>Bunium persicum</i> | Greatly threatened |
| <i>Colchicum luteum</i> * | Threatened |
| <i>Corydalis govaniana</i> | Likely to be threatened |
| <i>Dactylorhiza hatagirea</i> | Threatened |
| <i>Dioscorea deltoidea</i> | Threatened |
| <i>Ephedra gerardiana</i> | Likely to be threatened |
| <i>Ferula jaeschkeana</i> | Threatened |
| <i>Gentiana kurroa</i> | Threatened |
| <i>Hedychium spicatum</i> | Likely to be threatened |
| <i>Jurinea dolomiaea</i> | Likely to be threatened |
| <i>Nardostachys jatamansi</i> * | Threatened |
| <i>Orchis latifolia</i> | Threatened |
| <i>Picrorhiza kurroa</i> * | Likely to be threatened |
| <i>Podophyllum emodi</i> | Threatened |
| <i>Rheum emodi</i> | Threatened |
| <i>Swertia chirata</i> | Threatened |
| <i>Valeriana wallichii</i> | Likely to be threatened |
| <i>Zanthoxylum alatum</i> | Likely to be threatened |

- Species currently being researched under the Network.

Source: Botanical Survey of India - as quoted in S.S. Handa - 1992 - "Medicinal Plants Based Drug Industry and Emerging Plant Drugs".

THREATENED MEDICINAL PLANTS OF NEPAL

Acorus calamus
Asparagus racemosus
Cordyceps sinensis
Dactylorhiza hatagirea
Daiswa polyphylla
Fritillaria cirrhosa
Nardostachys grandiflora syn. *N. jatamansi*
Picrorhiza scrophulariiflora syn. *P. kurrooa*
Podophyllum hexandrum syn. *P. emodi*
Rauvolfia serpentina
Rheum australe syn. *R. emodi*
Rubia manjith syn. *R. cordifolia*
Swertia chirata
Valeriana jatamansi syn. *V. wallichii*

Source : *N.K. Bhattarai , “ Some Endangered Medicinal Plants of Nepal”. Information provided by the author.*

THE THREATENED MEDICINAL PLANTS OF SRI LANKA

Lycopodium clavatum
Lycopodium phlegmaria
Actiniopteris radiata
Helminthostachys zeylanica
Ophioglossum pendulum
Cycas circinalis
Semecarpus obovata
Semecarpus parvifolia
Artabotrys hexapetalus
Polyalthia persicaefolia
Xylopiia nigricans
Hunteria zeylanica
Petchia ceylanica
Rauvolfia serpentina
Cryptocoryne spiralis
Rhaphidophora decursiva
Hoya pauciflora
Marsdenia tenacissima
Oxystelma esculentum
Balanophora fungosa .
Impatiens repons
Gynura hispida
Xanthium indicum
Kalanchoe laciniata
Scirpodendron ghaeri
Vatica obscura
Dioscorea spicata
Cotylelobium scabriusculum
Hopea cordifolia.
Shorea disticha
Shorea ovalifolia
Vatica obscura
Diospyros atrata
Diospyros attenuata

Diospyros oppositifolia
Diospyros quaesita .
Elasocarpus montanus.
Agrostistachys hookeri
Cleistanthus collinus
Putranjiva zeylanica .
Calophyllum cuneifolium
Hippocratea macrantha .
Cinnamomum litseifolium.
Cryptocarya membranacea.
Acacia ferruginea
Adenanthera bicolor
Albizia amara
Cassia senna
Caesalpinia crista
Caesalpinia major
Cynometra iripa.
Desmodium gangeticum
Pericopsis mooniana
Memecylon grande
Coscinium fenestratum
Nymphoides aurantiaca
Broussonetia zeylanica
Ficus trimenii
Olea paniculata
Dendrobium maccarthiae
Rhynchostylis retusa
Areca concinna
Nypa frutican
Tricalysia erythospora
Palagium thwaitesii
Pentpetes phoenicea
Pterygota thwaitesii

Source : *The threatened plants of Sri Lanka - UNESCO-Man and the Biosphere National Committee for Sri Lanka*
Pub. No 10. Provided by : Dr. Lakshmi Arambewela, Ceylon Institute of Scientific and Industrial
Research (CISIR).

III-THE STATUS AND FUNCTIONING OF THE MAJOR SYSTEMS OF TRADITIONAL MEDICINE IN THE COUNTRIES OF THE REGION

THE STATUS AND FUNCTIONING OF TRADITIONAL SYSTEMS OF HEALTH IN BANGLADESH

There are mainly two systems practised in the country, Unani and Ayurveda. A Board has been set up for issuing registration, for maintaining the standard of the teaching institutions and for encouraging research. There are over 5000 registered practitioners in addition to about 3000 unregistered practitioners. Only 540 practitioners are institutionally qualified; there are four institutions which impart training in Unani and Ayurvedic systems of medicine.

These institutes offer a four-year diploma course with an intake of 50 students per year in each institute. There is a research institute for conducting research on drug action and on common diseases such as asthma. There are no government dispensaries; there are only two ayurvedic dispensaries run by the Zilla (district) Boards.

About 14 pharmacies manufacture ayurvedic medicines worth over one crore Takas (one crore Takas = US \$1,250,000) each annually. Two Unani pharmacies manufacture medicine worth slightly less than one crore Takas each. These pharmacies produce about 500 items of ayurvedic and 250 items of Unani medicines. (Source 1)

Micro-level survey data emanating from research undertaken in the city of Rajshahi and ten surrounding villages provides more information on the dimensions and reach of the traditional health care sector as well as provides insights into health related behaviour and patterns of usage and availability of health services at the level of the rural households in Bangladesh [(see below Tables 1 to 4). (Source 2)]

TABLE 1 : DATA (MONTHLY) ON AYURVEDIC MANUFACTURERS /SELLERS IN THE LOCAL CITY (RAJSHAHI)

| NAME | STATUS | NO. OF BRANCHES IN THE COUNTRY | AVERAGE NO. OF USERS | ESTIMATED TOTAL SALE | NO. OF PRODUCTS /BRANCHES |
|-------------------|----------|-----------------------------------|-------------------------|-------------------------|------------------------------|
| SADHANA | National | 83 | 125000 | 500000 | 250 |
| SREE DURGA | National | 14 | 1000 | 50000 | 230 |
| SHAKTI | National | 35 | 3000 | 86000 | 150 |
| KUNDESHWAR | National | 24 | 2500 | 20000 | 300 |
| AYURVED- KUTIR | Local | 1 | 2000 | 5000 | 250 |

1. Note estimated numbers of agents selling herbal medicine : 1500 in the country
2. Estimated total sale in the country : TK 26.4 million per month
3. Many minor manufactures are not included /Folk and family level use of medicinal plants are not included

TABLE 2 : TRADITIONAL MEDICINE USE IN 10 VILLAGES

| | HOUSE HOLD | NO OF PERSONS | NO OF LITERATE | NO OF AILING | USERS OF MODERN | TRADITIONAL | HOMEO- PATHY |
|----|---------------|------------------|-------------------|-----------------|--------------------|-------------|-----------------|
| NO | 3710 | 20613 | 4313 | 2303 | 125 | 699 | 242 |
| % | - | - | 24 | 12 | 55 | 30 | 10 |

TABLE 3 : MEDICAL PRACTITIONERS IN THE 10 VILLAGES

| | HERBAL | MODERN | HOMEOPATH | TOTAL |
|----|--------|--------|-----------|-------|
| NO | 57 | 63 | 30 | 150 |
| % | 38 | 42 | 20 | 100 |

TABLE 4 : PLANT SPECIES AND THEIR USE IN TRADITIONAL MEDICINE

| | | HERBS | SHRUBS | TREES | CLIMBERS | EPI- PHYTE | HYDRO- PHYTE | TOTAL |
|--------------|------------------------|-------|--------|-------|----------|---------------|-----------------|-------|
| DISTRICT 1 | TOTAL SPECIES | 141 | 65 | 59 | 88 | 4 | 10 | 354 |
| (4 VILLAGES) | SPECIES IN MEDICINE | 41 | 34 | 22 | 32 | - | 2 | 131 |
| DISTRICT 2 | TOTAL SPECIES | 139 | 49 | 69 | 53 | 9 | 11 | 330 |
| (6 VILLAGES) | SPECIES IN MEDICINE | 51 | 35 | 38 | 40 | 1 | 3 | 13 |

Percent of plant species used in medicine : 37 and 52 respectively

Source : (1) Data extracted from World Health Organization. Alma-Ata 1978. Primary health care: report of the International Conference on Primary Health Care, Alma-Ata, USSR, 6-12 September 1978, Geneva, 1978 ("Health for All" series No. 1) Copyright held by WHO. (2) Survey data provided by Prof. M.I. Zuberi, Centre for Environmental Research, University of Rajshahi.

THE STATUS AND FUNCTIONING OF THE MAJOR SYSTEMS OF TRADITIONAL MEDICINE IN INDIA

The traditional systems practised in India include Ayurveda, Siddha, Unani, Yoga, and the Naturopathy and Tibetan systems of medicine. These systems have been recognized by the Government for purpose of the national health services. There are 108 undergraduate teaching institutions in traditional systems of medicine awarding a degree following training for 4½ years in Ayurveda/Unani/Siddha. There are also two postgraduate institutes and 21 postgraduate departments awarding postgraduate degrees and doctorates. There is an exclusive Ayurveda University at Jamnagar in Gujarat - the only one in the world. A Statutory Council has been established to regulate the practice of these systems and minimum standards of education for these systems, which are being followed by all the undergraduate colleges throughout the country.

Currently there are 460,000 practitioners of traditional medicine in the country. Of this number, over 271,000 (223,000 Ayurveda, 30,456 Unani and 18,128 Siddha) practitioners are registered under the state boards. Some 186,000 practitioners are not registered with any of the boards or councils. Of the registered practitioners, 117,774 Ayurveda 10,268 Unani and 1559 Siddha practitioners are institutionally qualified. There are also about 145,000 practitioners of homeopathy.

In addition to a number of private pharmacies, almost all the State Governments have their own pharmacies for production of standard medicines. There also exist separate directorates for traditional systems of medicine in all the states; there is an adviser at the central level. There are, in all, 215 hospitals and 14,000 dispensaries in the country.

In order to encourage research in traditional systems of medicine the Government has also established four independent Central Research Councils, one each for Ayurveda and Siddha, Unani, Homeopathy and Yoga, and Naturopathy. Under these Councils about 50 research institutes and 200 units are carrying out clinical and drug research with a multidisciplinary approach, standardization, literary research, survey and surveillance, rural developmental programmes etc.

Source : Extracted from World Health Organization. Alma-Ata 1978. Primary health care: report of the International Conference on Primary Health Care, Alma-Ata, USSR, 6-12 September 1978, Geneva, 1978 ("Health for All" series, No. 1), Copyright held by WHO.

THE STATUS AND FUNCTIONING OF THE MAJOR SYSTEMS OF TRADITIONAL MEDICINE IN NEPAL

Ayurveda is practised in this country. There are 155 ayurvedic clinics (see below) and a 50-bed ayurvedic hospital. About 75% of the population resort to ayurvedic treatment. Facilities are available for intensive education in this system; there is a three-year certificate course. There are 350 institutionally qualified practitioners and about 1000 traditionally trained persons. Drug research and survey activities have been taken up.

NUMBER OF AYURVEDIC DISPENSARIES BY ZONE 1988/89 TO 1991/92

| ZONE | 1988/89 | 1989/90 | 1990/91 | 1991/92 |
|--------------|------------|------------|------------|------------|
| MECHI | 9 | 9 | 9 | 9 |
| KOSHI | 11 | 11 | 11 | 11 |
| SAGARMATHA | 8 | 8 | 8 | 8 |
| JANAKPUR | 11 | 11 | 11 | 11 |
| BAGMATI | 20 | 20 | 20 | 20 |
| NARAYANI | 10 | 10 | 10 | 10 |
| GANDAKI | 24 | 24 | 24 | 24 |
| LUMBINI | 13 | 13 | 13 | 13 |
| DHAULAGIRI | 7 | 7 | 7 | 7 |
| RAPTI | 9 | 9 | 9 | 9 |
| KARNALI | 4 | 4 | 4 | 4 |
| BHERI | 9 | 9 | 9 | 9 |
| SETI | 13 | 13 | 13 | 13 |
| MAHAKALI | 7 | 7 | 7 | 7 |
| TOTAL | 155 | 155 | 155 | 155 |

NUMBER OF AYURVEDIC PRACTITIONERS OF HMG NEPAL 1988/89 TO 1991/92

| PARTICULARS | 1988/89 | 1989/90 | 1990/91 | 1991/92 |
|---|------------|------------|------------|------------|
| KAVIRAJ VAIDYA (Gazetted and Non-Gazetted) | 292 | 370 | 333 | 338 |
| TOTAL | 292 | 370 | 333 | 338 |

Source: Ministry of Health, Department of Ayurveda. Provided by: Ramesh Shrestha, ANSAB, Nepal.

THE STATUS AND FUNCTIONING OF THE MAJOR SYSTEMS OF TRADITIONAL MEDICINE IN SRI LANKA

There are three traditional systems of medicine - Ayurveda, Siddha and Unani - being practised by 13562 registered traditional medical practitioners. There is a Government Ayurvedic College, which provides five years of systematic education to about 150 students every year. Research activities have been conducted at the Bandaranaike Ayurvedic Research Institute since 1962. There are four Government ayurvedic hospitals, four dispensaries and 240 ayurvedic dispensaries run by the local government institutions. The practice of traditional medicine is controlled by an Act. Drugs are being produced by several establishments on a commercial scale with the total number of registered herbal drug manufacturers being 84.

Source : Extracted from World Health Organization. Alma-Ata 1978. Primary health care: report of the International Conference on Primary Health Care, Alma-Ata, USSR, 6-12 September 1978, Geneva, 1978 ("Health for All" series, No. 1), copyright held by WHO; and updated on basis of information provided by Dr. Lakshmi Arambewela, Ceylon Institute of Scientific and Industrial Research.

IV - TRADE IN MEDICINAL PLANTS

MEDICINAL PLANTS EXPORTED FROM INDIA

| Plant Name | Plant Part Exported |
|-----------------------------|---------------------|
| <i>Plantago ovata</i> | Seed and husk |
| <i>Cassia angustifolia</i> | Leaf and pod |
| <i>Rheum australe</i> | Rhizome |
| <i>Inula racemosa</i> | Rhizome |
| <i>Rauwolfia serpentina</i> | Roots |
| <i>Hedychium spicatum</i> | Rhizome |
| <i>Zingiber officinale</i> | Rhizome |
| <i>Colchicum luteum</i> | Rhizome and seed |
| <i>Valeriana wallichii</i> | Rhizome |
| <i>Acorus calamus</i> | Rhizome |
| <i>Adhatoda vasica</i> | Whole plant |
| <i>Juglans regia</i> | Bark |
| <i>Punica granatum</i> | Flower, root, bark |
| <i>Barberis aristata</i> | Root |
| <i>Juniperus communis</i> | Fruit |
| <i>J. macropoda</i> | Fruit |
| <i>Heracleum candicans</i> | Rhizome |
| <i>Picrorhiza kurrao</i> | Root |
| <i>Aconitum species</i> | Root |
| <i>Saussurea lappa</i> | Rhizome |
| <i>Swertia chirata</i> | Whole plant |
| <i>Podophyllum emodii</i> | Rhizome |

Source: Species noted by S.S. Handa (1992) in "Medicinal Plants Based Drug Industry and Emerging Plant Drugs".

MEDICINAL PLANTS IMPORTED TO INDIA

Plant

Glycyrrhiza glabra
Pimpinella anisum
Thymus vulgaris
Operculina turpethum
Cuscuta epithymum
Smilax ornata
S. china
Lavendula stoechas

Source: *Species noted by S.S. Handa (1992) in “Medicinal Plants Based Drug Industry and Emerging Plant Drugs”.*

V - DATA FROM OUR PRIVATE SECTOR PARTNERS

ARYA VAIDYA SALA, KOTTAKAL :

Data on resource use patterns, income, employment and health care coverage

There are approximately 550 plants "imported" from northern states

- | | |
|---|--|
| 1. how many tonnes | : 500 tonnes (dried) |
| 2. percentage roots | : Roots/Rhizome 25% |
| 3. from what state/ regions are plants collected | : Calcutta, Orissa, Assam, Maharashtra, UP, MP, Delhi, Punjab and Kashmir |
| 4. approx market purchase value | : Rs. 5.2 Crore (approx. US \$ 1.6m) |
| 5. costs for collection and transport. | : 2 - 3% |

Approximately 150 plants are cultivated in Kerala

- | | |
|------------------------------|---------------------------------------|
| 1. how many tonnes | : 400 tonnes |
| 2. percentage of roots | : 40% |
| 3. approx. market value | : Rs. 4 crores (approx. US \$ 1.35m) |
| 4. number of people involved | : 1,600 |
| 5. income generated | : Rs. 6 crores (approx. US \$ 2m) |

Processing

- | | |
|--|---------------------------------------|
| 1. number of people involved | : 540 |
| 2. approx market sales value | : Rs. 8 crores (approx. US \$ 2.65m) |
| 3. tonnes stored annually | : 400 tonnes |
| 4. estimated tonnage lost during storage | : 0.25 tonne |

Hospital

- | | |
|-------------------------------|---|
| 1. number of staff | : 200 |
| 2. number of patients | : inpatient - 1,395 out patients. - 6,650 |
| 3. income generated per annum | : Rs 79,00,000 (approx. US \$ 263,000) |

Source: Rough estimates of orders of magnitude involved in a typical year - Courtesy Prof. V.P.K. Nambiar, Arya Vaidya Sala, Kottakal.

**KEY MEDICINAL PLANT SPECIES USED BY:
VENKATESWARA AYURVEDA NILAYAM, CHINTALURU. EAST GODAVARI
DISTRICT. A.P. SOUTH INDIA**

| NO. | SCIENTIFIC NAME | FAMILY | PARTS USED | NO OF PRE- PERATIONS USED IN | 1993 - 1994 | ACTUALLY PROCURED IN WHICH STATE |
|-----|---------------------------------|----------------|--------------------|------------------------------------|-------------------|--------------------------------------|
| 1. | <i>Hemidesmus indicus</i> | ASCLEPIADACEAE | ROOTS, STEM | 25 | 400 | EAST GODAVARI (DT) ANDHRA PRADESH |
| 2. | <i>Trichosanthes cucumernia</i> | CUCURBITACEAE | WHOLE PLANT | 10 | 200 | EAST GODAVARI (DT) ANDHRA PRADESH |
| 3. | <i>Hydrocotyle asiatica</i> | APIACEAE | WHOLE PLANT | 10 | 400 | EAST GODAVARI (DT) ANDHRA PRADESH |
| 4. | <i>Asparagus racemosus</i> | LILIACEAE | TUBEROUS ROOT S | 20 | 250 | EAST GODAVARI (DT) ANDHRA PRADESH |
| 5. | <i>Eclipta prostrata</i> | ASTERACEAE | WHOLE PLANT | 25 | 400 | EAST GODAVARI (DT) ANDHRA PRADESH |
| 6. | <i>Bombay malabaricum</i> | BOMBACACEAE | BARK, STEM | 20 | 100 | EAST GODAVARI (DT) ANDHRA PRADESH |
| 7. | <i>Acacia catechu</i> | LEGUMINOSAE | BARK, STEM | 12 | 600 | ANDHRA PRADESH AND KARNATAKA |
| 8. | <i>Cedrus deodara</i> | PINACEAE | HEART WOOD | 25 | 200 | TAMILNADU AND KARNATAKA |
| 9. | <i>Chonemorpha fragrans</i> | APOCYNACEAE | ROOTS | 15 | | |
| 10. | <i>Cinnamomum zeylanicum</i> | LAURACEAE | BARK | 30 | 300 | KERALA |
| 11. | <i>Plumbago zeylanica</i> | PLUMBAGINACEAE | ROOTS | 20 | 100 | ANDHRA PRADESH |
| 12. | <i>Abies webbiana</i> | CONIEREAE | LEAVES | 05 | 50 | TAMILNADU |
| 13. | <i>Saraca indica</i> | LEGUMINOSAE | BARK | 05 | 400 | TAMILNADU |
| 14. | <i>Withania somnifera</i> | SOLANACEAE | ROOTS | 15 | 475 | WEST BENGAL AND UTTAR PRADESH |
| 15. | <i>Ipomoea reniformis</i> | COMPOSITAE | STEM, BRANCHES | 15 | 075 | EUROPEAN COUNTRIES |

APPENDIX I

AGENDA

MEDICINAL PLANTS RESEARCH NETWORK [SOUTH ASIA] FIRST NETWORK MEETING

DATE: FEBRUARY 6-8, 1995 VENUE: CALICUT, KERALA, INDIA

| | | | |
|------------|---------------|--|---|
| February 6 | 09.00 - 10.00 | Welcome Address: | Dr. Cherla B. Sastry Dr. P.K. Warriar |
| | 10.00 - 10.30 | Introduction of participants | |
| | 10.30 - 10.45 | Coffee Break | |
| | 10.45 - 12.00 | Discussion - Chairman: Lead Discussant: | 'Bio-diversity' Dr. Keith Shawe Ms. Manjul Bajaj |
| | 12.00 - 13.15 | Discussion - Chairman: Lead Discussant: | 'Safety & Efficacy Issues' Dr. P.V. Subba Rao Dr. Trevor Williams |
| | 13.15 - 14.30 | Lunch Break | |
| | 14.30 - 15.45 | Discussion - Chairman: Lead Discussant: | 'Socio-Economic Issues' Dr. John Lambert Ms. Manjul Bajaj |
| | 15.45 - 16.00 | Tea/Coffee Break | |
| | 16.00 - 17.15 | Discussion - Chairman: Lead Discussant: | 'Health Care Systems' Dr. A.V. Rao Dr. Vijayalakshmi Ravindranath |
| | | | |
| February 7 | 09.00 - 13.00 | Working Group Discussions [Concurrent] | |
| | | Working Group I: | Defining Research Priorities for the Network. |
| | | Working Group II: | Drafting a Code of Conduct for Medicinal Plant/ Traditional Medicine Research & Review of IDRC Ethical Guidelines |
| | 13.00 - 14.00 | Lunch Break | |
| | 14.00 - 16.00 | Finalization of Working Group Reports and Report write-up. | |
| February 8 | 16.00 - 17.00 | Presentation of Working Group Reports by Working Group Chairman/Rapporteurs | |
| | 17.00 - 17.30 | Conclusion and Round up | |
| | 08.30 - 16.00 | Field Trip - Visit to Kottakkal Arya Vaidya Sala, Kottakkal, Malappuram District, Kerala | |
| | 18.30 pm | Kathakali Recital followed by Dinner | |

APPENDIX II

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Healing Forests, Healing People - Report of a Workshop on Medicinal Plants

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The report summarizes the discussions at the first meeting of the IDRC-supported medicinal plants (South Asia) network held between the 6-8 February 1995. The report brings together and discusses the main issues relevant to medicinal plants research. Discussions are organized into four thematic areas with a chapter devoted to each - biodiversity, safety and efficacy, socio-economic issues and health systems. The report also presents the collective wisdom of the group in the shape of two specific outputs - one, a section on research priorities highlighting future directions and two, a Code of Conduct for researchers engaged in this highly sensitive area of research. An additional section on Facts and Figures provides key statistics and data relevant to South Asia.

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