

HEALTH AND BIODIVERSITY:
THEMATIC
BIODIVERSITY STRATEGY
AND ACTION PLAN

PREPARED UNDER
THE NATIONAL BIODIVERSITY STRATEGY
AND ACTION PLAN - INDIA



CENTRE FOR INDIAN KNOWLEDGE SYSTEMS,
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PREFACE

The National Biodiversity Strategy and Action Plan (NBSAP), a project of the Union Ministry of Environment & Forests (MoEF) aims to produce a series of planning documents dealing with the conservation of India's biodiversity, sustainable use of its biological resources, and equity including in decisions regarding access to such resources and the benefits accruing from them. The project is funded by the Global Environment Facility through United Nations Development Programme (UNDP). A unique aspect of the project is that its technical execution is by a Technical and Policy Core Group (TPCG) being coordinated by an NGO Kalpavriksh, and its administrative coordination is by Biotech Consortium India Ltd. The NBSAP process has included extremely widespread consultation across the country and across all sectors of society, involving tens of thousands of people. It aims to produce not one national action plan, but 18 local (substate) plans, 33 state and union territory plans, 10 ecoregional (interstate) plans, and 13 thematic plans. All these will coalesce into a national plan, but will also remain independent for implementation purposes. In addition, over 30 thematic papers have been commissioned on a variety of topics related to biodiversity.

Within this overall process, one of the action plans is on Health and Biodiversity which has been drafted by a working group consisting of persons experienced in the field. The list of members of the Thematic Work Group which was formed in July-August 2000 has been given in Appendix 1. This report has been put together through a combination of meetings, survey in selected areas and literature survey. Appendix II gives a brief description to the NBSAP process. Appendix III gives a list of various individuals and institutions who have contributed to this process. Various Annexures have been given in Part II of the report. The emphasis has been on making a special effort to obtain inputs from the stake holders whose voice is normally not heard in the planning and implementation process namely – households, folk healers and raw drug collectors. This is a revised form of the initial draft. This is meant to be for wider circulation and feedback from various stake holders before finalisation and incorporation with the effort of the Biodiversity Strategy and Action Plan.

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Thematic Working Group – Health and Biodiversity

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LIST OF ABBREVIATIONS

AAJVS	Andaman Adim Janjati Vikas Samiti
A and N	Andaman and Nicobar
ADS	Academy of Development Science
AICRPE	All India Coordinated Research Project on Ethnobiology
AP	Andhra Pradesh
AVP	Arya Vaidya Pharmacy
BSI	Botanical Survey of India
CAMP	Conservation Assessment and Management Plan
CBD	Conservation of Bio Diversity
CBD	Convention on Biological Diversity
CCD	Covenant Centre for Development
CHETNA	Centre for Health, Education and Training in Nutrition Action
CIKS	Centre for Indian Knowledge Systems
CIMAP	Central Institute of Medicinal and Aromatic Plants
CITES	Convention on International Trade in Endangered Species of Flora and Fauna
CP	Common Properties
CPR	Common Property Resources
CR	Critically Endangered
CSIR	Council for Scientific and Industrial Research
DoE	Department of Environment
EN	Endangered
FRLHT	Foundation for Revitalization of Local Health Traditions

G	Globally
GSFDC	Gujrat State Forest Development Corporation
GMP	Good Manufacturing Practice
Ha	Hectares
HP	Himachal Pradesh
ICAR	Indian Council for Agricultural Research
ICHI	Independent Commission on Health in India
ICMR	Indian Council for Medical Research
IPR	Intellectual Property Rights
ISM	Indian Systems of Medicine
IUCN	International Union for Conservation of Nature
J&K	Jammu and Kashmir
KA	Karnataka
KFD	Kyasanur Forest Disease
KHG	Kitchen Herbal Garden
KL	Kerala
LSPSS	Lok Swasthya Parampara Samvardhan Samithi
MAH	Maharashtra
MoEF	Ministry of Environment and Forest
MPCA	Medicinal Plants Conversation Area
MPCN	Medicinal Plants Conversation Network
NBRI	National Botanical Research Institute
NBSAP	National Biodiversity Strategy and Action Plan
NIN	National Institute of Nutrition
NISCOM	National Institute of Science Communication

NNMB	National Nutrition Monitoring Bureau
NRCMAP	National Research Centre for Medicinal and Aromatic Plants
NSS	National Sample Survey
NTFP	Non-timber Forest Products
PDS	Public Distribution System
PRI	Panchayath Raj Institutions
RALHT	Rapid Assessment of Local Health Traditions
RRC	Regional Research Centre
SAHAJ	Society for Health Alternatives
SSC	Species Survival Commission
TBA	Traditional Birth Attendants
TBGRI	Tropical Botanical Garden and Research Institute
TCM	Traditional Chinese Medicine
TCS	Tribal cooperative Societies
TEAM	Traditional East Asian Medicine
TKRC	Traditional Knowledge Resource Classification
TKDL	Traditional Knowledge Digital Library
TN	Tamil Nadu
TWG	Thematic Working Group
WAHI	Women and Health Initiatives
WIPO	World Intellectual Property Organisation
ZSI	Zoological Survey of India

EXECUTIVE SUMMARY

INTRODUCTION

Biodiversity in the form of plants and animals from the major resource base of Indian Health Traditions. It provides the basis for health by means of food and medicine. The Thematic Working Group decided to identify the links between health and biodiversity by collecting information from literature as well as from various stakeholders. It was decided to place special emphasis on stakeholders, whose views are generally not heard in the planning process, namely – folk healers, raw drug collectors and households.

MAJOR ISSUES

The relationship between Nutrition / Agriculture and Biodiversity is very poorly studied and understood. In terms of bioresources, for over a century modern botanical studies have been carried out on the occurrence and distribution of medicinal flora across various geographical zones of India. Traditional medicine has a vast, comprehensive and deep understanding of plants. It is estimated that in Ayurveda, Siddha and Unani traditions, medicines make use of about 2000 plant species while folk traditions use over 9,500 plant species. A large number of animal species (including birds, reptiles, insects etc.) are also used. The “back bone” of the traditional medicinal system is indeed the folk systems whose carriers range from generalists like herbal healers to specialists like Traditional Birth Attendants (TBAs) and Bonesetters, and also include the vast knowledge of home remedies, food and nutrition, that is found extensively in each household. The ISM establishment has a large infrastructure which however suffers from major draw backs – it is very poorly endowed (receiving less than 5% of the total health budget), it shows no official “awareness” (leave alone giving help or recognition) of the folk traditions and the folk traditions are under a threat of erosion due to diverse reasons.

ONGOING INITIATIVES

During the last 25 years there have been some hopeful initiatives in the NGO sector to strengthen and revitalize Folk Health Traditions. These have included - formation of sangams of Vaidyas, strengthening the resource base (especially medicinal plants), detailed studies / documentation about specific sites / tribes and some moves to recognize / honor Nattu vaidyas. The efforts of SHODHINI network and the subsequent emergence of WAH (Women and Health Initiative) have given particular emphasis to the assessment of biodiversity and its relation to health needs from the women’s perspective. The government has publicized a draft policy on ISM inviting comments, and a Natural Medicinal Plants Board has been constituted. The Planning Commission has set up a Task Force on promotion and cultivation of medicinal plants. The All India Coordinated Research Project on Ethnobiology is a very important initiative. There is a great deal of public discussion and awareness about Traditional Knowledge and Biodiversity and a Traditional Knowledge Digital Library Project has been launched. In the year 2001, the Government of India had come out with a draft National Policy on ISM, which is the most comprehensive post independence statement on that subject.

RECOMMENDATIONS

A. **NUTRITION AND BIODIVERSITY**

Studies that examine / illustrate or have a lesson in terms of the links between Health and Biodiversity are very few. They need be analyzed in detail and lessons from them incorporated into the plans. Also, more such studies need to be planned. Two types of diversification would help national as well as household food and nutrition security, - diversification within food grains, i.e. millets and legumes besides cereals and diversification between food grains, horticulture (fruits and vegetables) and livestock products. The government needs to formulate agriculture policy / programs based on the local food pattern and ensure production of traditional food crops (along with new hybrid crops and cash crops) as well as their availability to be in local markets, Public distribution systems, Anganwadi, mid-day meal programs and hospitals. In the case of subsistence dependent communities the Government should – maintain their traditional access to water and forests. Only they can we ensure their health. This is particularly important during time of crisis or stress (e.g.) Drought period.

B. **FOLK TRADITIONS**

Need For Information : *There are no estimates at a National or state level about folk medicinal traditions, in terms of their numbers, distribution, specialization, transmission of knowledge etc. It is suggested that some baseline statistics on them can be obtained by compilation and analysis of detailed information available with NGOs or academics who have detailed knowledge about folk traditions in small areas or about specific communities / tribes, making these estimates part of an exercise such as the National Sample Survey (NSS), and eventually working towards a special study of Folk Health Traditions as part of the 2011 census operation.*

All India Coordinated Research Project on Ethnobiology: The All India Coordinated Research Project on Ethnobiology (AICRPE) is an eye opener in terms of the great richness and diversity of folk medical knowledge. The results of the studies need to be made public. First and foremost all the people who gave the information need to be the recipients of the synthesized results. Also, the development of location oriented production technology for the upliftment of the tribal communities, needs to be given importance.

Perceptions of Nattu Vaidyas: In the perception of the Nattu vaidyas themselves, some of the important recommendations emerged. Efforts can be initiated by the State and Central Government as well as private bodies to recognize and publicly honor outstanding Nattu Vaidyas who are carriers of the traditions. Cultivation of difficult to obtain species and the species identified as being suitable for cultivation in home gardens, can be supported. Contracts to collect NTFP should be given to local communities including NGOs, Vaidyar Sangams. Small-scale pharmacies can be set up at the local village / district level to be managed locally. Efforts should be made towards the introduction of a certification procedure for all products that make use of natural products and biodegradable products with the mark – “Bio-friendly”. Bodies must be created for organization, regulation, upgradation and promotion of local healer development and dissemination of information on traditional healing in local language and for networking. Communities, health workers, and supervisors, program planners and educators must be educated on the traditional foods and concepts of diet - time, seasonality and festivals,

role and importance of herbs in primary health care, importance of environment, impact of environment degradation on peoples health and the means for its conservation.

Needs of women: Particular attention should be paid to the needs of women as well as to make an assessment of the relationship between health and biodiversity as seen from a woman's perspective. The experiences of SHODHINI network and the recommendations of the Woman and Health Initiative (WAH) serve as a good starting point on this matter.

C. BIORESOURCES FOR HEALTH CARE : PLANTS AND ANIMALS

Some of the immediate tasks are - completing the unfinished task of inventorying floristic, faunistic and microbial diversity in the under or unexplored regions, execution of flora of India and fauna of India work within a definite time frame, and making detailed assessments of threat status of all medicinal plants.

In situ conservation strategies: In the context of medicinal plants the most effective way of undertaking conservation of inter and intra-specific diversity is by creating a network of in situ forest reserves across different forest habitats that may exist in a country. The size of the forest reserves in tropical forests could be 200 to 500 hectares size each. In the high altitude forests, it could be around 50 hectares. A network of such forest reserves will act as "in situ gene banks" of the medicinal plants of the country. These in situ gene banks can provide breeders and growers access to the wild genetic resources for cultivation programs. It is far cheaper than cryo-preservation of any other ex-situ approach. Each gene bank should be located in different forest types and across the altitudinal range existing in the State so that across a network of 10-15 gene banks, one can capture the entire range of inter-specific diversity of the medicinal plants of the State.

Ex situ conservation programs : Policy intervention is, urgently needed to encourage and facilitate investments into commercial cultivation of medicinal plants. 'Polyculture' models for cultivation of medicinal plants where the species mix is based on natural associations, may be preferable to mono-culture cultivation. It is also advised to grow plants organically in their native agro-climatic locations and in habitats where they are naturally distributed.

Cultivation: It is estimated that all over India, there are only around 20,000 hectares under cultivation of medicinal plants. The extent of cultivation is inversely linked to prevalence of easy and cheap collection from the wild, lack of regulation in trade, cornering of the profits from wild collection by a vast network of traders and middlemen and absence of schemes of industry for providing buy-back guarantees to growers. Cultivation of medicinal plants is also difficult due to lack of standardised agronomic practices for most species and unavailability of sources of quality planting materials. Policy measures to promote cultivation of medicinal plants therefore need to facilitate industry's role by way of providing incentives to industries for sourcing of their raw material from cultivation and for their investments in agricultural research. There is simultaneously also a need to regulate indiscriminate and destructive collection of medicinal plants from the wild, particularly for

endangered species. In the context of medicinal plants, there is a special case for encouraging organic systems & Polyculture models instead of the conventional mono-culture models currently prevalent in agriculture and agro-forestry. Given India's large population and food security needs, it is not wise to shift agricultural lands committed to food crops to growing medicinal plants. There is, therefore, a special case for encouraging in an organised way, (on the *AMUL* milk model) an "area" approach wherein in a contiguous area, thousands of small, marginal farmers and tribals can be encouraged to grow medicinal plants in their household gardens, bunds and wastelands rather than promoting big farmers, and large plantations strategy. The bottlenecks for cultivation need to be addressed – providing remuneration prices / buy back guarantee and generating information on agronomic production and economics of cultivation.

Quality Control and Technology Inputs: We need to, urgently develop creative pharmacognostic methods based on traditional knowledge. The current official standards are only related to the botany and chemistry of plants, but ignore their biological activity. There is need for technology interventions related to post-harvesting viz., drying and storage of medicinal plants. Help needs to be given for processing by communities at village level, to obtain better returns. Also, support is needed for quality control, marketing, labeling.

Trade: *Harvest in the wild, must be regulated. Corrections needed in the supply side are – (i) well laid out inventory of medicinal herb occurring in the wild; (ii) statistics of their incremental aspects for ensuring that only the periodic increments are removed scientifically; (iii) rejuvenation of the degraded forests with the regeneration of medicinal plants; (iv) cultivation of endangered and extinct species in forest nurseries and on degraded common properties (CPs). There are some successful interventions in terms of sale, in Kerala, Gujrat etc. that can be tested.*

Community based Initiatives: *There are some promising community based initiatives that can serve the twin objectives of conservation and delivery of health care. One such initiative is the Kitchen Health Garden (KHG) initiative. The KHG programme can be a very important method to combine biodiversity with Health and Nutrition involving the committee in a big way. Some factors that can help are - creating awareness that home remedies are the first line of action for ill health, focussing on a few common complaints initially, clinical trials to validate simple medicinal plant based treatments, for common complaints. Nutritional plants can be included in the medicinal plant packages. Allopathic physicians require pharmaceutical and pharmacognosy training on medicinal plants. The Government should come with regulations for incorporating these in regular medical training.*

Animal Products: In the context of the use of animal products in traditional medicine, studies need to be undertaken on the use of animal products by folk practitioners other than tribals, and in various ISM texts and the sustainable use and harvest of many of these animal products.

D. ISM POLICY

ISM should explicitly recognize the existence of and support the strengthening and revitalization of tribal / folk traditions besides the classical traditions. The Government role should be that of a facilitator rather than the sole actor and non-government agencies must also be involved in the planning and implementation of all aspect of ISM. There must be emphasis on the use of ISM epistemology in research, drug development and standardization.

Some of the key recommendations pertaining to medicinal plants are –

- It is necessary to offer remunerative prices for cultivated herbs and to make the price of produce collected from the wild at such a level that cultivation is desirable;
- Conservation must be based on a network of forest based in-situ gene banks paying attention to inter and intra specific diversity of medicinal plants;

- The scope of the National Medicinal Plants Board needs to be enlarged so that it serves the need of not only the pharmaceutical industry but also the non-commercial users (folk practitioners, households etc.);

The recommendation of the planning commission Task Force on preservation, promotion and cultivation of medicinal plants are also oriented largely to the big corporates. Involvement of local communities, traditional healers etc in these activities has been ignored.

The ISM policy should also be revised and expanded taking specific note of the recommendations that have emerged from the WAH network which has produced a critique and specific suggestions based on the requirement of women.

IPR and Traditional Knowledge: In the context of various efforts to document traditional knowledge it is important that the method to recompense be in place before, the information being recorded is made public. It has been stated by experts that – “By designing the structure of the traditional knowledge database appropriately, it is possible to make the knowledge available to all and at the same time retain the control necessary for benefit sharing to be operationalised”.

CHAPTER – I

INTRODUCTION

I. BACKGROUND

Biodiversity in the form of plants (> 8000 species) and animals form the resource base of Indian Health Traditions (Folk, Ayurveda, Unani, Siddha and Tibetan systems). The applications of these resources cover prevention of diseases, cure and promotion of health. Poorer sections of society are especially dependent on biological resources for health requirements, and women in rural areas use herbal remedies for their special gynecological, pregnancy, and related needs. An inventory of the resources used by these systems would be a necessary and basic step for their conservation.

Biodiversity contributes to keeping the world's population healthy by providing the raw materials for the production of pharmaceuticals. For example, 57% of the top 150 prescription drugs sold in the U.S are derived from plants and animals and sales of plant-based drugs in the U.S. amounted to \$15.5 billion in 1990 (Grifo and Rosenthal 1997). Traditional medicine, based primarily on the use of local plants and animals, is the basis of health care for about 80% of the people living in developing countries. More than 5000 species of plants and animals are used in China (as cited in Margoluis 1996)

Apart from natural resources that are directly used as medicine, local, Eco-system specific wild vegetables, grains, animals, fish as well as other biological forms and biological products have contributed to local food and nutritional needs. Again, this is particularly true of poorer sections of society. Women in their traditional roles have been especially mindful of the contributions of biodiversity to food security. These resources and practices need to be identified and conserved so that their sustainable use can continue. There is also a critical two way relationship between local food traditions and biodiversity (wild and cultivated) viz. on the one hand food traditions, depend on available biodiversity and on the other the traditional diet patterns contribute to continued cultivation and conservation of biologically diverse crops. It is estimated that out of over 3900 plant species traditionally used for food till recently only a tiny fraction are cultivated and available in the market place.

Forest ecosystems and biodiversity in other ecosystems also contributes to the psychological and mental well being of communities and thus to their health care. Destruction and degradation of natural habitats probably contributes to ill health of the entire ecosystem including that of human communities' livestock and other life forms that depend on it. There are not very many empirical studies on this relationship between health and biodiversity, but it is another area that needs to be examined.

In the above ways, biodiversity in India has served the 'health' needs of our people and therefore its conservation is of concern to individuals and institutions concerned with 'health care' needs. Planners and policy makers need to be sensitive to this 'utility' aspect of biodiversity while preparing conservation plans.

II. SCOPE AND OBJECTIVES

Given the above, the Working Group decided that it should:

- a. Examine and describe our current understanding of the relationship between biodiversity and human health (individual and community, men and women); and identify gaps in this understanding.
- b. Assess the current status of health care based on biodiversity, in particular on medicinal plants and animals, amongst different sections of India's populations, and differentially amongst men and women;
- c. Identify critical traditions and knowledge of health care based on biodiversity, both oral and written, folk and classical, and differentially amongst men and women; in particular, assess the extent of plant resources and related knowledge used by local health cultures all over India based on published ethno-botanical literature.
- d. Identify the sites and populations in which the relationship between health care and biodiversity is still very strong;
- e. Assess the specific relationship between biodiversity (in the wild and agricultural) and nutritional needs of communities and individuals (men and women through their life cycles);
- f. Assess the threats to health care based on biodiversity, including to the medicinal plants and animals, and to related traditions and knowledge; Identify and assess ongoing efforts to revise or strengthen the relationship between health care and biodiversity, and gaps therein; this should include attempts to safeguard ethno-medicinal knowledge and gaps therein;
- g. List measures (short and long term) to plug these gaps;
- h. Prioritize these measures in terms of their importance and immediacy;

III. METHODOLOGY FOR OBTAINING INFORMATION

The following were identified as some of the mechanisms to be used to obtain inputs from various stakeholders

A. OBTAINING INFORMATION FROM HOUSEHOLDS, FOLK MEDICAL PRACTITIONERS AND RAW DRUG COLLECTORS

It was felt that in each of these cases the most important source for information would be collecting inputs from NGOs who are working in various areas. In this context, it was noticed that there are several NGOs operating in many parts of the country who have

already formed large networks such as Lok Swasthya Parampara Samvardhan Samitha (LSPSS), Voluntary Health Association of India etc.

B. ISM PRACTITIONERS

It was felt that in this case the best method would be to approach professional associations such as for example, the All India Ayurveda Mahasammelan. Many large professional associations were in existence with some of them having membership and structures at the National, State and even sub-state level. Wherever possible such associations would also be requested to convene meetings of their members or representative bodies to provide their opinion on these issues.

C. STATE FOREST DEPARTMENTS

In this case, it was felt that we should approach the Inspector General of Forests through the Ministry of Environment to convene a meeting with suitable preparation for discussion on this subject.

D. INDUSTRIES

It was felt that we should approach certain apex bodies of Industries as well as drug manufacturers association involved in the manufacture of traditional medicine to gather this information.

E. GOVERNMENT INSTITUTIONS

It was felt that in order to obtain information quickly and to ensure that there is serious and considered response, this initiative should be taken by the Ministry of Environment itself. It was decided that we should request Dr.Lakshmi Raghupathi, representative of the Ministry of Environment to take this initiative.

F. LITERATURE SEARCH

A survey of literature on the relation between Health and Biodiversity.

Details regarding the various stakeholders and the data to be obtained from them has been given in Annexure I.

CHAPTER II

DESCRIPTION OF THE THEME

I. BIODIVERSITY PROFILE OF INDIA

India is the seventh largest country in the world and Asia's second largest nation with an area of 3,287,263 square km. The Indian mainland stretches from 8° 4' to 37° 6' N latitude and from 68° 7' to 97° 25' E longitude. It has a land frontier of some 15,200 kms and a coastline of 7,516 km (Government of India, 1985). India's northern frontiers are with Xizang (Tibet) in the Peoples Republic of China, Nepal and Bhutan. In the north-west, India borders on Pakistan; in the north-east, China and Burma; and in the east, Burma. The southern peninsula extends into the tropical waters of the Indian Ocean with the Bay of Bengal lying to the south-east and the Arabian Sea to the south-west. For administrative purposes India is divided into 24 states and 7 union territories. The country is home to around 846 million people, about 16% of the World's population (1990 figures).

SPECIES DIVERSITY

India contains a great wealth of biological diversity in its forests, its wetlands and in its marine areas. This richness is shown in absolute numbers of species and the proportion they represent of the world total (see Table 1).

TABLE 1: COMPARISON BETWEEN THE NUMBER OF SPECIES IN INDIA AND THE WORLD

Group	Number of species in India (SI)	Number of species in the world (SW)	SI/SW (%)
Mammals	350(1)	4,629(7)	7.6
Birds	1224(2)	9,702(8)	12.6
Reptiles	408(3)	6,550(9)	6.2
Amphibians	197(4)	4,522(10)	4.4
Fishes	2546(5)	21,730(11)	11.7
Flowering Plants	15,000(6)	250,000(12)	6.0

(Source: IUCN)

India has great many scientific institutes and university departments interested in various aspects of biodiversity. A large number of scientists and technicians have been engaged in inventory, research, and monitoring. The general state of knowledge about the distribution and richness of the country's biological resources is therefore fairly good.

ENDEMIC SPECIES

India has many endemic plant and vertebrate species. Among plants, species endemism is estimated at 33% with c. 140 endemic genera but no endemic families (Botanical Survey of India, 1983). Areas rich in endemism are north-east India, the Western Ghats and the north-western and eastern Himalayas. A small pocket of local endemism also occurs in the Eastern Ghats (MacKinnon & MacKinnon, 1986). The Gangetic plains are generally poor in endemics, while the Andaman and Nicobar Islands contribute at least 220 species to the endemic flora of India (Botanical Survey of India, 1983). WCMC's Threatened Plants Unit (TPU) is in the preliminary stages of cataloguing the world's centres of plant diversity; approximately 150 botanical sites worldwide are so far recognised as important for conservation action, but others are constantly being identified (IUCN, 1987). Five locations have so far been issued for India: the Agastyamalai Hills, Silent Valley and New Amarambalam Reserve and Periyar National Park (all in the Western Ghats), and the Eastern and Western Himalayas.

TABLE 2: SUMMARY OF PLANT CONSERVATION STATUS INFORMATION AT WCMC

IUCN Threat category	Number of species
Extinct	19
Extinct/Endangered	43
Endangered	149
Endangered/Vulnerable	2
Vulnerable	108
Rare	256
Indeterminate	719
Insufficiently Known	9
No information	1441
Not threatened	374
TOTAL	3120

II. RELATION BETWEEN HEALTH AND BIODIVERSITY

There are two major aspects to this relationship, namely, the relationship between biodiversity and Nutrition and the relationship between biodiversity and the use of plants and animals for healthcare.

1. BIODIVERSITY AND NUTRITION

This is a very critical relationship, but unfortunately a matter on which very little is studied or known in very concrete terms. It has been noted that the declining trend

in the prevalence of world hunger is currently come to a near stand still. The FAO had set a target for reducing the population of the World's hungry atleast to a half by 2016. This meant that atleast twenty million should come out of the hunger trap every year. Unfortunately, the actual rate of decline has been less than eight million per year. Since the early 1990s it has been estimated that 25% of the world's hungry are in India despite the fact that the Government of India had a buffer stock of about sixty million tons of Wheat and Rice in December 2001(Swaminathan M.S. 2002)

All of the world's major food crops – including corn, wheat and sorghum – depend on new genetic material from the wild to remain productive. Seventy-five percent of the world's staple crops rely on wild animal species for pollination (Daily 1997). Biodiversity in the world's oceans is equally important for human nutrition – in 1995 alone, approximately 97 million tons of fish were commercially harvested for food and other products (UNEP 1999). Much of the world's rural populations rely on hunting and fishing for food. For example, 75% of protein consumed in the Congo comes from wild sources. In areas of Botswana, over 50 species of wild animals provide approximately 40% of people's dietary protein (as cited in margoluis 1996). In a Piaroa forest community of Venezuela, residents receive on average 83% of their protein and 72% of their fat from wild plant and animal sources (Melnyk 1995) and (Margoluis, Richard et al (undated).

2. INDIAN STUDIES

The complex relationship between diversification of agriculture (food grains, horticulture, livestock) and its impact on human nutrition, demand for resources and socio-economic determinants of diversification was discussed at a symposium of 'Diversification of Agriculture for Human Nutrition' that was convened by the well known nutritionist Dr. Mahtab Bamji. (Bamji, Mahtab, 2000). Kamala Krishnaswamy (National Institute of Nutrition) posed the problem of malnutrition in the country. The surveys conducted by the National Nutrition Monitoring Bureau show that the diet of urban and rural poor is deficient in several nutrients, notably vitamins and minerals. Diversification to nutrient-rich millets, fruits, vegetables and livestock products can help to bridge the gap in nutrient intakes provided these foods are accessible to the poor. According to M.V. Rao, while the production of rice and wheat have shown remarkable increase both in terms of area and productivity per unit area, production of millets and legumes (pulses) has languished. Today, India ranks first in the production of milk and second in the production of fruits. Even so, the production fails to meet the present demand for fruits, vegetables and livestock products due to low productivity and post-harvest losses. The intake of these protective foods by the poor has shown none or only marginal increase. Diversification within food crops and between food crops and livestock helps nutrition security, particularly for small and marginal farmers. Similar trends were seen in a micro study in Andhra Pradesh discussed by P. Geervani. However, Geervani pointed out that diversification to non-food crops must ensure local food and nutrition security and community education to ensure that additional income is used for food. In conclusion, it was felt that agricultural diversification within food grains (millets, legumes beside cereals) and between food grains, and horticulture (fruits and

vegetables) and livestock products is essential for both national and household food and nutrition security.

3. NUTRITION AND BIODIVERSITY – FIELD OBSERVATIONS

Studies exploring the link between the Nature and Biodiversity are few and there is very little information available on this subject. However, there have been reports which have suggested that even in times of droughts, communities that have a closer link to their bio resources and biodiversity fare much better than the communities that are more remote from them. Take for example the case of malnutrition that occurred in the area in and around the Melghat Forest in Maharashtra. Melghat has a geographical area close to 4,000 Sq.km of which about 75% is forest land. It has a tribal population in excess of 75%. Ms Shiela Barse, Human Rights Activist filed a petition in Nagpur High court seeking information about and redressal in Korku communities reeling under the impact of hunger and illness. It was revealed that 1,075 children had died in 1996 alone. It was also revealed that the death of infants had taken place outside the tiger reserve in areas where the forests have been degraded and urbanization has replaced the forests. Inside the tiger reserves, the Korkus and other forest dwellers were able to collect fruit tubers, medicinal plants, fibre and barks. These resources combined with traditional knowledge regarding their use was able to save the lives of the children. (Sahgal, Bittu. 2001).

III. MEDICINAL PLANTS AS A COMPONENT OF BIO-DIVERSITY

1. MEDICINAL PLANTS OF DIVERSE LIFE-FORMS AND FAMILIES

Analysis of life forms of medicinal plants indicates that a little more than one third are trees. Herbs form around one third of the population. Shrubs and climbers form a little more than one third of the total. Medicinal species are also found in lower plant groups like algae, fungi, lichens, bryophytes, pteridophytes, gymnosperms and angiosperms. Of the 386 families and 2200 genera in which medicinal plants are recorded, the families Asteraceae, Euphorbiaceae, Limiaceae, Fabaceae, Rubiaceae, Poaceae, Acanthaceae, Rosaceae and Apiaceae share the larger proportion of medicinal plant species, with the highest number of species (419) falling under Asteraceae.

2. DISTRIBUTION OF INDIAN MEDICINAL FLORA ACROSS BIO GEOGRAPHICAL ZONES OF THE COUNTRY

The analysis of the distribution of medicinal plants shows that they are distributed across diverse habitats and landscapes. Around 70% of India's medicinal plants are found in the tropical areas mostly in the various forest types spread across the western and eastern ghats, the Vindhyas, Chotta Nagpur plateau, Aravalis, the Terai region in the foothills of Himalayas and the North East. While less than 30% of the medicinal plants are found in the temperate and alpine areas of higher altitudes which include species of high medicinal value. A small number of medicinal plants are also found in aquatic habitats and mangroves. Studies show that a larger percentage of the known medicinal plants occur in the dry and moist deciduous vegetation as compared to the evergreen or temperate habitats.

The diversity of India's flora, as also the medicinal plant species which form a sub-set of this flora, is spread across different bio-geographic zones of the country. India's land surface has been grouped into ten distinct bio-geographic zones and these are further divided into 25 biotic provinces – these have been listed in Table A (Rodgers, W.A. and H.S.Panwar, 1988). The forest areas of these bio-geographic zones/provinces are classified into 16 major forest types, and more than 200 subtypes, by Champion and Seth

(Champion & Seth, 1968). In order to arrive at a broad picture of medicinal plant diversity occurring in different regions of our country, an attempt has been made to enlist first level estimates of medicinal plant diversity recorded in each such bio-geographic zone/region (See Map 1).

MAP.1 BIOGEOGRAPHICAL ZONES OF INDIA

TABLE 3 : BIOGEOGRAPHIC ZONES AND PROVINCES

Biogeographic Zone		Biotic Province	
1	Trans-Himalayan	1A	Tibetan
2	<i>Himalayan</i>	2A	<i>North West Himalaya</i>
		2B	West Himalaya
		2C	Central Himalaya
	2D		<i>East Himalaya</i>
3	<i>Desert</i>	3A	<i>Kutch</i>
		3B	Thar
4	<i>Semi-Arid</i>	4A	<i>Punjab</i>

- | | | | | |
|---|------------------|----|----------------------|------------------------|
| | | | 4B | Gujarat-Rajwara |
| 5 | Western Ghats | 5A | Malabar Coast | |
| | | | 5B | Western Ghat Mountains |
| 6 | Deccan Peninsula | | 6A | Deccan Plateau South |
| | | | 6B | Central Plateau |
| | | | 6C | Eastern Plateau |
| | | | 6D | Chhota-Nagpur |
| | | | 6E | Central Highlands |
| 7 | Gangetic Plain | 7A | Upper Gangetic Plain | |
| | | | 7B | Lower Gangetic Plain |
| 8 | North-East India | 8A | Brahmaputra Valley | |
| | | | 8B | Assam Hills |
| 9 | Islands | | 9A | Andaman Islands |
| | | | 9B | Nicobar Islands |
| | | | 9C | Lakshadweep Islands |
| | | 10 | Coasts | 10A West Coast |
| | | | 10B | East Coast |

The “Trans Himalayan” (1) bio-geographic zone is estimated to harbour approximately 700 known medicinal plant species. Some of the well known ones, existing in the very cold and desert like conditions of this region are *Ephedra gerardiana* Wall., *Hippophae rhamnoides* L., *Arnebia euchroma* (Royle) John etc.

The “Himalayan” (2) bio-geographic zone consists of North-West Himalaya (2A), West Himalaya (2B), Central Himalaya (2C) and East Himalaya (2D) biotic provinces. The North-West and West Himalaya (2A & 2B) region is estimated to harbour approximately 1700 known medicinal plant species. Some of the well known medicinal species, of this region, are *Aconitum heterophyllum* Wall. Ex Royle, *Ferula jaeschkeana* Vatke and *Saussurea costus* (Balc.) Lipsd. The last one i.e. *S. costus* (syn. *S. lappa* C. B. Clarke) is in fact confined to only the Himalayan region of Jammu & Kashmir state and is cultivated elsewhere, including Lahaul district of Himachal Pradesh. This is the only Indian medicinal plant species enlisted in Appendix I of CITES (Convention on International Trade in Endangered Species of flora and fauna). The Central and Eastern Himalayan (2C & 2D) biotic provinces, put together, are estimated to harbour around 1200 known medicinal plant species. A few of the well known ones are *Nardostachys grandiflora* DC., *Taxus wallichiana* Zucc., *Rhododendron anthopogon* D.Don and *Panax pseudoginseng* Wall. The last one i.e. *P. pseudoginseng* is confined to the Eastern

Himalaya, in India. *N.grandiflora* DC & *Taxus wallichiana* Zucc., are already included in appendix II of CITES.

The Desert (3) bio-geographic zone consists of biotic provinces of Kutch (3A) and Thar (3B). In spite of the fact that this region supports only sparse vegetation, it harbours almost 500 known medicinal plant species. Some of the well known ones, of this region, are *Convolvulus microphyllus* Seib ex Spreng (Syn *C. pluricaulis* Chois), *Tecomella undulata* (Sm.) Seem, *Citrullus colocynthis* (L.) Schrader and *Cressa cretica* L.

The semi-arid zone (4) consists of biotic provinces of Punjab (4A) and Gujarat –Rajwar (4B) and is estimated to harbour around 1000 known medicinal plant species. Some of the well known ones, of this region, are *Commiphora wightii* (A.) Bhandari, *Caesalpinia bonduc* (L.) Roxb., *Balanites aegyptiaca* (L.) Delile and *Tribulus rajasthanensis* Bhandari & Sharma. The last one is almost endemic to this region in India while extending into adjoining areas of Pakistan also.

The Western Ghats bio-geographic zone (5) consists of two biotic provinces namely Malabar coast (5A) and Western Ghat Mountains (5B). This region is known for the wealth of its bio-diversity and is known as one of the eighteen hot spots of bio-diversity recognized across the globe. It is estimated to harbour approximately 2000 known medicinal plant species and many of these are endemic to this region. Examples of such endemic medicinal species are *Myristica malabarica* Lam., *Garcinia indica* (Dup.) Choisy, *Utleria salicifolia* Bedd. and *Vateria indica* L.

The Deccan Peninsula (6) covers the largest chunk of land mass, amongst all the ten bio-geographic zones, and consists of five biotic provinces namely “Deccan Plateau South” (6A), “Central Plateau” (6B), “Eastern Plateau” (6C), “Chhota Nagpur” (6D) and “Central Highlands” (6E). This bio-geographic zone harbours the highest proportion of India’s entire medicinal plant diversity and the total number of known medicinal plant species is estimated at approximately 3000. The well known endemic medicinal species of this zone are *Pterocarpus santalinus* L.f., *Decalepis hamiltonii* Wight & Arn., *Terminalia pallida* Brandis and *Shorea tumbergaia* Roxb. *Pterocarpus santalinus*, L.f is already included in appendix II of CITES.

The Gangetic Plain (7) bio-geographic zone consisting of biotic provinces of “Upper Gangetic Plain” (7A) and “Lower Gangetic Plain” (7B) are estimated to harbour around 1000 known medicinal plant species and some of the well known ones of this region, are *Holarrhena pubescens* (Buch-Ham.) Wallich ex DC., *Mallotus philippensis* (Lam.) Muell-Arg., *Pluchea lanceolata* C. B. Clarke and *Peganum harmala* L.

The North-East India (8) is another high bio-diversity region and is one of the eighteen hot spots, with high levels of endemism, like Western Ghats. This zone consists of two biotic provinces namely Brahmaputra Valley (8A) and Assam Hills (8B). This zone is estimated to harbour nearly 2000 plant species of known medicinal value.

Some of the well known and important medicinal plants of this zone are *Aquilaria malaccensis* Lam., *Smilax glabra* Roxb., *Ambroma augusta* (L.) L.f. and *Hydnocarpus kurzii* (King) Warb. *A. malaccensis* Lam., is already included in appendix II of CITES.

The “Islands” (9) bio-geographic zone consists of three biotic provinces namely Andaman Islands (9A), Nicobar Islands (9B) and Lakshadweep Islands (9C). An estimated 1000 known medicinal plant species are estimated to occur in this zone. Some of the important medicinal plants of this zone are *Calophyllum inophyllum* L., *Adenantha pavonina* L., *Barringtonia asiatica* (L.) Kurz and *Aisandra butyracea* (Roxb.) Baehni.

The “Coasts” (10) bio-geographic zone comprises of two biotic provinces namely “West Coast”(10A) and “East Coast” (10B) and is estimated to harbour around 500 plant species of known medicinal value. Some of the well known ones, amongst these are *Rhizophora mucronata* Lam., *Acanthus ilicifolius* L., *Avicennia marina* Vierh and *Sonneratia caseolaris* (L.) Engl.

3. TRADITIONAL DEFINITION OF MEDICINAL PLANTS

The ancient Indian literature incorporates a remarkably broad definition of medicinal plants and considers ‘all’ plant entities to be potential sources of medicinal substances.

“.....jagathyevamanoushadham na kinchit vidyathe dravyam
vassannarthauogayo.....”

There is nothing in this universe, which is non-medicinal, which cannot be made use of for many purposes and by many modes.

{*Ashtanga Hridaya, Sutrasthana, 9 chapter, 10 verse*}

While all plant entities are thus potentially medicinal, at a practical level, only those plants whose use has already been discovered for human or veterinary application are considered ‘medicinal’. Such an application could either be in the western bio-medical system, homeopathy and various traditional systems of medicine, viz, Ayurveda, Siddha, Tibetan and Unani.

4. NUMBER OF SPECIES OF MEDICINAL PLANTS USED BY VARIOUS MEDICAL CULTURES

Analysis of published information on medicinal plant use, indicates that around 8000 species are used by the different systems of medicine in India. Their distributes in terms of species used by various systems is given in Table 4.

TABLE 4 : PLANT SPECIES USED BY VARIOUS MEDICAL SYSTEMS

AYURVEDA	1769
FOLK	4671
HOMEOPATHY	482
SIDDHA	1121
TIBETAN (SWA-RIGPA)	279
UNANI	751

Source: FRLHT database

It is evident that the Indian people have a tremendous passion for medicinal plants. In the oral traditions, local communities in every ecosystem right from the trans-Himalayas down to the coastal plains have discovered the medical uses of thousands of local plants found in their surrounding. They use them for a very wide range of health related applications from common cold to memory improvement; treatment of poisonous snake bites to cure for muscular dystrophy and enhancement of the body's general immunity. India also has one of the richest codified plant medicine cultures in the world. There are thousands of medical manuscripts of Ayurveda, Siddha, Unani and the Swa Rigpa medical traditions. The Indian medical heritage (oral and codified) is of tremendous contemporary relevance because it can on one hand ensure health security to millions of people and on the other hand it can provide new and safe herbal drugs to the entire world. There are estimated to be around 50,000 effective plants based formulations used in folk medicine known to rural communities all over India. Around 25,000 brilliantly designed formulations are available in the indigenous medical texts many of which are yet to be sufficiently tapped.

5. RURAL COMMUNITIES THE LARGEST USER OF MEDICINAL PLANTS

The largest user of medicinal plants are the Eco-system people. Millions of rural households use local Eco-system specific plants (around 8000 species) for medicinal

purposes. The uses of plants by rural communities are ethnic community specific. For example, whereas the Brahmins and other upper castes worship the Tulsi plant and use it for cough, cold and fever, the tribals also use this plant to treat lice in the hair or rub it on the skin to treat the itching caused by insect bites. In rural communities, apart from the use of plants by households, there are also specialized folk healers (estimated to be around one million) who have special knowledge of the medicinal properties of plants. The folk healers can be categorized into (a) traditional birth attendants (TBAs), (b) general physicians, (c) visha {poison} specialists, (d) bone setters, (e) specialists who treat ENT, dental, mental, muscular and nervous disorders. In the 18th century, British medical professionals reported that smallpox inoculation and plastic surgery of the nose was also carried out by folk healers (Dharampal, 1971). In 1992, an American Nobel prize winner has filed a patent claim on the use of the plant *Phyllanthus amarus* for treatment of viral hepatitis B & C, based on a lead derived from a widespread folk remedy. Some illustrations about the richness and diversity of folk traditions have been given in Annexure II.

SOME MEDICINAL PLANTS USED BY THE MADAV KOLI TRIBALS

In each locality of India, there are local communities that have a rich knowledge of the use of plants. Table 5 lists the plants used by Madav Koli tribals for various purposes.

TABLE 5 : PROFILE OF PLANTS USED BY MADAV KOLI TRIBALS

Purpose	No. of Plants
1. Medicinal uses	202
2. Veterinary uses	109
3. For fish poison	23
4. For pest control	51
5. For water purification	3

SHODHINI COMPILATION

Concerned about the fast vanishing local health traditions, SHODHINI – a network of women’s health activists came together in search of a Woman centered approach as an alternative system. They came up with an interesting evaluative compilation of plants. Some illustrations from their list are given in Table 5A.

TABLE 5A: EVALUATIVE COMPILATION OF PLANTS

Herb's Name and Part Used	Problem	Regions of Usage	Total No. of Users (Women)	Comments
<i>Allium sativum</i> (garlic cloves)	Yellow vaginal discharge caused by trichomonas infection	Andhra, Delhi, Gujarat and Karnataka	38	Works well, but male partner also needs treatment
<i>Allium sativum</i> (garlic cloves)	Back pain	Andhra and Karnataka	21	Consume orally until infection is cleared fully and apply externally with oil
<i>Allium sativum</i> (garlic cloves)	Stomach pain due to flatulence	Andhra and Tamilnadu	27	Works well, especially in pain associated with acidity
<i>Asparagus racemosus</i> (Shatavari) (root)	Non-specific vaginal infection	U.P., Karnataka Andhra and Gujarat	37	Is cooling and a tonic, cures infection resulting from weakness and low resistance
<i>Asparagus racemosus</i> (Shatavari) (root)	Weakness, anaemia leading to heavy bleeding in menstruation	Karnataka and Tamil Nadu	42	Is cooling and a tonic, cures infection resulting from weakness and low resistance
<i>Azadirachta indica</i> (Neem)	Chronic vaginal infection	Andhra and Gujarat	41	Very effective; is an antiseptic and a blood purifier
<i>Mimosa pudica</i> (Touch-me-not) (full plant)	Heavy and/or irregular bleeding	Karnataka and Andhra	28	Especially for heavy bleeding associated with weakness and fatigue
<i>Mimosa pudica</i> (Touch-me-not) (full plant)	Painful periods	Tamil Nadu, Karnataka and Andhra	38	Very effective

<i>Mimosa pudica</i> (Touch-me-not) (full plant)	Non-specific vaginal infection	Karnataka and Tamil Nadu	23	Works as an immunity promoter
<i>Mimosa pudica</i> (Touch-me-not) (full plant)	Body pain, fever	Karnataka and Tamil Nadu	35	Works as an immunity promoter
<i>Phyllanthus emblica</i> (Indian gooseberry) (fruit)	Chronic vaginal infection	Tamil Nadu, Andhra and Karnataka	28	Works well, has healing and body-building powers
<i>Phyllanthus emblica</i> (Indian gooseberry) (fruit)	Anaemia and weakness	Tamil Nadu, Andhra and Karnataka	31	Works well, has healing and body-building powers
<i>Phyllanthus emblica</i> (Indian gooseberry) (fruit)	Heavy bleeding during periods due to anaemia	Tamil Nadu, Andhra and Karnataka	11	Works well, has healing and body-building powers.

Source: Gupta, Anu et.al. 1997

BOX 1 : 'FOLK' AND 'CLASSICAL'

For example, songs and literary works are classified in five groups based on how they are formulated and how easy they are, to comprehend, namely as, *Narikelapaakam*, *Ikshupaakam*, *Kadaleepaakam*, *Drakshaapaakam* and *Ksheerapaakam*. The form most difficult to comprehend is the *Narikelapaakam* – it is like a coconut; to be eaten, the shell must be broken, the fruit grated and then mixed with food. Next is *Ikshupaakam*, the sugarcane form – which has to be crushed to extract the juice. Next is the *Kadalipaakam*, the banana form which has to be just peeled to be eaten. Easier still is the *Drakshapaakam* – grape form which can be eaten without which can be eaten without any processing, and the easiest of all is the *Ksheerapaakam* or the milk form which can not only

be easily consumed, but also is a wholesome food for all ages and people in all conditions. In a similar vein Sanskrit the literary compositions are classified into three groups : *Prabhu Samhitha*, *Suhrut Samhitha* and *Kaantha Samhitha*. *Prabhu Samhitha* instructs like a *Prabhu* or Master who punishes when rules are transgressed (eg. instructions such as in the *Vedas*), *Suhrut Samhitha* instructs like a friend who advises on what to do and what not to do (Eg. like the *Puranaas*), and *Kaantha Samhitha* which instructs like *Kaantha* or one's beloved who advises and cites examples, coaxes or pleades or persuades as the situation may require to achieve the same end, namely 'upadesa' (Eg. as in *Kaavyam*).

It is noteworthy that these different formulations or forms of communication are not understood as being part of hierarchical system where one can replace or supersede another or is considered the generally superior form. Each one serves as specific need and may be the most appropriate for a particular context of for a given purpose. What do our shastras themselves say about the relation between ISMs and LSPs?

The *Charaka-Samhitha* states (*Sutra sthaana*, Chapter I, *Shloka* 120-121) that - *Oushadihi naama roopabhyaam, jananthe hyajapaa vane, avipaashcaiva gopaashcha ye cha Anye vanavaasinaha* - "the goat herds, shepherds, cowherds and other forest dwellers know the drugs by name and form". Similarly *Susrutha* states (*Sutra sthaana*, Chapter 36, *Shloka* 10) that - "*Gopaalaasthaapasaa vyaadhaa ye chaanye Vana charinaha, Moola jaathihi cha tebhyo Bheshaja vyakthi Ishyathe*" - one can know about the drugs from the cowherds, thapasvis, hunters, those who live in the forest and those who live by eating roots and tubers.

CARRIERS OF FOLK MEDICINE STREAM

While there are no precise figures available in terms of the number of folk medical practitioners, some estimates by FRLHT are given in Table 6. The folk practitioners use diverse natural resources and make use of various drug forms.

TABLE 6: ESTIMATES OF NUMBERS OF FOLK PRACTITIONERS

Traditional carriers	Subjects	Nos.
Housewives & elders	Home remedies food and nutrition	Millions
Traditional birth attendants	Normal deliveries	7 lakhs

Herbal healers lakhs	Common ailments	3
Bone setters	Orthopaedics	60,000
Visha Vaidyas	Natural poisons	60,000
[snake, scorpion, dog...]		
Specialists	Nethra	1000 in
	Skin	each area
	Respiratory	
	Dental	
	Arthritis	
	Mental diseases	
	Liver	
	GIT	
	Wounds	
	Fistula Piles	

It is essential in a future national strategy on medicinal plants to develop a network of Taluka level nurseries to ensure supply of medicinal plants to rural households and to the vast number of folk healers.

IV. PLANTS IN TRADE

There are around 861 plants in all India trade. Around 720 are sourced from the wild. About 70 species are cultivated and an equal number are imported. It is estimated that around Rs.1400 crores value of plants are used annually by the Indian herbal industry. This is 30% of the Rs.4000 crore domestic turnover of the industry and includes 66% of the Rs.300 crore export turnover, of the herbal sector. Around 90% of the plants used by the Indian herbal industry are currently harvested from the wild and only around 30 species (excluding spices and aromatic plants) are under small scale (less than 20,000 HA) commercial cultivation all over India. (FRLHT Database). The situation of wild harvest is unsustainable and needs urgent policy interventions to regulate trade in plants sourced from wild and also to provide incentives to encourage domestication.

THREAT STATUS OF MEDICINAL PLANTS

There is inadequate information on the threat status of wild populations of medicinal plants of India. The World Conservation Union (IUCN, 1997) has published a compilation of threatened plants of the world in 1997 which lists more than 34,000 vascular plant species in the threatened category, suggesting that across the globe, nearly 12.5% of known flowering plants are threatened with extinction. In the absence of any systematic assessment of such threatened medicinal plant species of India, it may be reasonable to extend the same proportion (12.5%) to the 8000 medicinal plant species enlisted in India. This suggests that about 1000 medicinal plant species of India may be threatened with extinction and more than 300 of these are likely to be endemic or near endemic.

A few rapid threat assessment exercises based on an IUCN recommended methodology that have been carried out for parts of the Western and Eastern Ghats, North India and the Trans-himalayan region, have revealed that around 200 medicinal species are threatened to various degrees as per IUCN red-list categories. It is important to urgently carry out rapid threat assessment exercises for medicinal plants in all the States of India, [the "taxonomic databases working group" has recognised Indian States as 'basic units' for study of phyto-geography] to get a first level of information on the conservation status of India's medicinal plants.

ASSESSMENT OF CONSERVATION STATUS OF MEDICINAL PLANTS

In India, FRLHT has made efforts to assess the threat status of medicinal plants through a series of Conservation Assessment and Management Plan (CAMP) workshops. FRLHT carried out the following CAMP exercises in recent years.

1. CAMP workshops for South Indian species - 3 camps held: 1995, 1996 and 1997 all in Bangalore
2. Medicinal plants of Jammu & Kashmir and Himachal Pradesh. Held in Kullu (HP) 16-19 of April, 1998
3. Medicinal plants of Andhra Pradesh - March, 2001 at Hyderabad
4. Medicinal plants of Maharashtra - February, 2001 at Pune

The results of the above exercises are given in Annexure III.

CHAPTER III

CURRENT KNOWLEDGE OF HEALTH AND BIODIVERSITY

I. CURRENT STATUS OF MEDICINAL PLANTS CONSERVATION

The following is an overview, based on the information from the Ministry of Environment and Forest, GOL (Raghupathy, L. 2000)

IN-SITU & EX-SITU CONSERVATION OF MEDICINAL PLANTS

- 4.5% of the total geographical area of the country is covered under protected area network comprising 86 National Parks and 448 Wild life Sanctuaries. There are other ecologically fragile areas where some protective measures that include Biosphere Reserves, Mangroves, Wetlands and Lakes. These protected areas harbour large varieties of medicinal plants. In-situ conservation programmes for medicinal plants in the National Parks and Sanctuaries could be taken up through Chief Wild Life Wardens. The programme needs to be in consonance with the objectives of the National Parks and Sanctuaries.
- In the Southern States of Kerala, Tamil Nadu and Karnataka, Medicinal Plants Conservation Areas (MPCA) networks have been established for in-situ protection. Forest Departments of the concerned states and Foundation for Revitalisation of Local Health Traditions (FRLHT) are involved in these efforts.
- The National Afforestation and Endevlopment Board (NAEB) is promoting conservation and raising of medicinal plants species under Non Timber Forest Produce (NTFP) programme by involving local communities and tribals inhabiting these areas.
- Most Forest Departments of the States and Forest Development Corporations have plantation plots in forest areas for in-situ protection.
- The development of nurseries, herbal gardens, medicinal plant gardens, and arboretum contribute to the ex-situ conservation of medicinal plants. It is estimated that there are 50 ethno-medicinal plant gardens in different parts of the country. Herbal gardens are maintained by several Agricultural Universities, State Forest Departments and Directorate of Indian System of Medicines.
- Under the Joint Forest Management Programme (JFM) ex-situ conservation of medicinal plants in degraded forest areas is undertaken. The State Forest Departments of Karnataka, Kerala and Tamil Nadu have developed Medicinal Plants Development Area (MPDA) in collaboration with Foundation for Revitalisation of Local Health Traditions.
- Botanic Gardens, including those maintained by Botanic Survey of India (BSI) are actively involved in ex-situ conservation of rare and endangered medicinal plants.

- Three National Gene Banks have been set up Central Institute of Medicinal and Aromatic Plants (CIMAP) in Lucknow; National Bureau of Plant Genetic Resources (NBPGR) in New Delhi; and Tropical Botanic Garden Research Institute (TBGRI) in Tiruvananthapuram. A fourth Gene Bank is being proposed in Regional Research Laboratory (RRL) in Jammu.

BIOLOGICAL DIVERSITY IN INDIA

- Since the 1980s the Botanical Survey of India and Zoological Survey of India have brought out Red Data Books on endangered plants and animals following the IUCN guidelines. An exercise for validation of the status of such species in the country has been initiated. In addition to initiatives by the Botanical Survey of India and Zoological Survey of India, Non Governmental Organisations are actively involved in programmes of conservation prioritization to assess the status of species in India. Initiatives on conservation assessment have so far covered medicinal plants, mangroves, soil invertebrates, fresh water fish, amphibians, reptiles and mammals.
- MoEF has also sponsored workshops on Conservation and Sustainable use of Medicinal Plants, Industries involvement in the Conservation and Sustainable use of Biological Diversity and Conservation and Sustainable Use of Coastal and Marine Biological Diversity. An All India Co-ordinated Project on Coastal and Marine Biological Diversity is also being developed.

SACRED GROVES IN INDIA

Sacred Groves are dedicated by local communities to specific Gods and Goddesses or ancestral spirits. They may range anywhere from a clump of trees or even one single tree to a small forest that may extend to a few hundred acres. It has been estimated that there are anywhere from a hundred thousand to a hundred and fifty thousand sacred groves present in various parts of the country. The biological value of sacred groves may indeed be very high. Sacred groves in general act as a nursery and store house of many Ayurvedic, tribal and folk medicines. For example, a sacred grove occupying only 1.4 Sq.km contain 722 species of angiosperms compared with 960 species that occur in 90 Sq.km of the Silent Valley forest in Kerala. Species that are not under any immediate risk of extinction if preserved in sacred groves may have the potential of diverse uses in future. (Malhotra Kailash C., Yogesh Gokhale, Sudipto.Chatterjee, 2001). Professor Malhotra and his colleagues have published an annotated Bibliography of sacred groves in India.(Malhotra Kailash C., Yogesh Gokhale and Ketaki Das. 2001).

II. INFRASTRUCTURE OF INDIAN SYSTEMS OF MEDICINE

Indian Systems of Medicine have a tremendous presence in terms of the material and human resource base in the country. They have been outlined in a series of tables given below. This information has been drawn from the website of the Department of ISM. The accompanying tables indicate that there are over 3,000 hospitals of ISM, over 400 colleges and about 4.8 lakh practitioners (in addition to 1.94 lakh practitioners of

Homoeopathy). The Government has set up two Regulatory Bodies namely the Central Council for Indian Medicine and Central Council of Homoeopathy and four councils for research. National Institutes have been set up for each of these systems (except for Siddha and Unani which are under establishment).

MANUFACTURES OF ISM

An ISM industry is a 4200 crore industry with a major share belonging to Ayurveda which is to the tune of Rs.3,500 crores. There are about 8,500 Ayurvedic pharmacies in the country. The Global market for herbal medicine is about 62 billion US Dollars of which the Indian market namely 976 Million US Dollar is a very small part.

TABLE – 7

Indian Systems of Medicine & Homoeopathy Hospitals and Dispensaries in the country	
Hospitals	3004
Beds	60666
Dispensaries	23028

TABLE – 8

Medical Education Facilities in India		
System	Colleges	
	Under-graduate	Post-Graduate
Ayurveda	198	53
Unani	39	5
Siddha	2	2
Homoeopathy	166	17
Total	405	77

Admission	16845	821
Capacity		

TABLE – 9

Registered Medical Practitioners in India	
Ayurveda	427504
Unani	42445
Siddha	16599
Naturopathy	429
Homoeopathy	194147
Total	681124

TABLE – 10

Acts administered in the ISM Sector	
1.	Central Council of Indian Medicine Act 1970
2.	Central Council of Homoeopathy Act 1973
3.	Drugs & Cosmetics Act 1940 and Rulesthereunder
4.	Drugs & Magic Remedies (Objectionable Advertisement) Act 1954 & 1955 and Rules thereunder
5.	Medicinal & Toilet Preparations Act & Rules 1995-96

TABLE – 11

Statutory Regulatory Bodies for ISM under Government of India
Central Council of Indian Medicine
Central Council of Homoeopathy
(for regulating standards of Medical Education and registering practitioners)
Drug Technical Advisory Board (ASUDTAB) for advising on all aspects related to drug standardization and quality control of Indian Systems of

Medicine.

TABLE – 12

Research Councils under Central Government

Engaged in clinical research activities on drugs of Indian Systems, survey on Medicinal Plants, drugs standardization, tribal and family welfare research carried out through units set up in different parts of the country.

Central Council for Research in Ayurveda & Siddha	36 Units
Central Council for Research in Unani Medicine	32 Units
Central Council for Research in Homoeopathy	51 Units
Central Council for Research in Yoga & Naturopathy	

TABLE – 13

National Institutes set up by Department of Indian Systems of Medicine & Homoeopathy, Government of India for producing graduates and post-graduates of high quality for conducting research and to provide quality medical care

National Institute of Ayurveda, Jaipur

National Institute of Unani Medicine, Bangalore (Under establishment)

National Institute of Homoeopathy, Calcutta

National Institute of Naturopathy, Pune

Morarji Desai National Institute of Yoga, New Delhi

National Institute of Siddha, Chennai (Under establishment)

Rashtriya Ayurveda Vidyapeeth, New Delhi

TABLE – 14

Licensed Pharmacies in India

8533

Ayurveda

Unani	462
Siddha	385
Homoeopathy	613
Total	9992

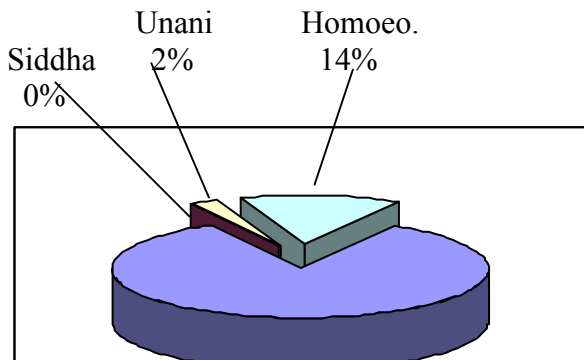
TABLE – 15

ISM Industry - At a Glance

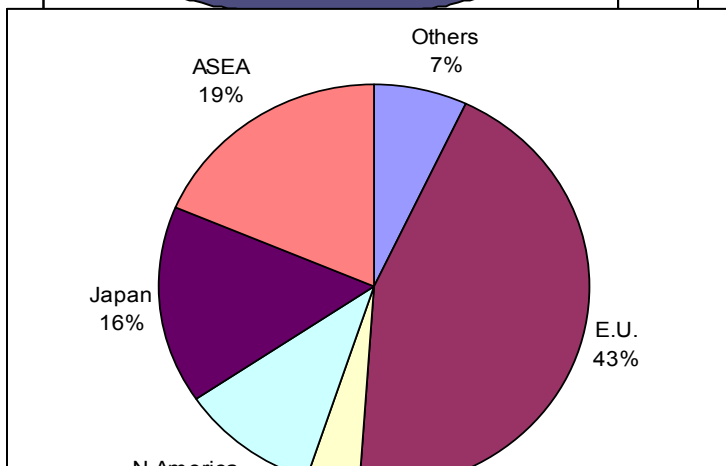
- Rs.4200 crore Industry (Rs.3500 Ayurveda)
- 7000 manufacturers of Ayurvedic products

- Large	> 50 cr.	10
- Medium	5-50 cr.	25
- Small	1-5 cr.	965
- Very small	> 1 cr.	6000

TABLE – 16 ISM & H MARKET IN INDIA



System	Market Size	
	Rs. Cr.	US \$ m.
Ayurveda	3,500	813
Homeo.	600	139
Siddha	5	1
Unani	100	23
Total	4205	976



MARKET : US \$ 62 B.

Market	Size
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MEDICINAL PLANTS – BIODIVERSITY COMPONENT

Need for Policy Intervention on Conservation of Medicinal Plants

One can make the bold assertion that medicinal plants ought to be given the status of a national resource. This is because their sustained availability is essential to sustain one of world's oldest medical traditions, a priceless legacy of the Indian people. Millions of rural households use medicinal plants in a self-help mode. Over one and a half million practitioners of the Indian Systems of Medicine, in the oral and codified streams use medicinal plants in preventive, promotive and curative applications. There are estimated to be over 8000 manufacturing units in India with a combined annual turnover of Rs.4000 crores/year. In recent years, the growing demand for herbal product has led to a quantum jump in volumes of plant material traded within and across countries. Conservative estimates put the economic value of medicinal plant related International trade to be of the order of US \$ 880 million and this is growing. While the demand for medicinal plants is increasing, their survival in their natural habitats is under growing threat. This is due to rapid loss & fragmentation of natural habitats and in certain cases due to over harvesting of specific species. Species like *Coscinium fenestratum*, *Janakia aryalpathra*, *Dactylorhiza hatagirea*, *Saussurea costus* are critically endangered in the wild. It is expected that around a 1000 species of medicinal plants are facing threat to their existence in the wild, and some of them like *Plectranthus vettiveroides*, have become extinct in the wild.

III. KNOWLEDGE ABOUT THE USE OF PLANT AND ANIMAL SPECIES IN TRADITIONAL MEDICINE

1. ALL INDIA COORDINATED RESEARCH PROJECT ON ETHNOBIOLOGY

Tribals constitute 6% of the Indian population and they belong to 550 communities of 227 ethnic groups. They perhaps, have a much richer relationship and linkages with biodiversity for their livelihood and other needs. In 1982, the Government of India commenced the All India Coordinated Research Project on Ethnobiology (AICRPE) to make a survey on various aspects of the knowledge of tribal communities regarding the flora and fauna of the country and its uses. The mid term report of the project was published in 1984. Some of the important findings from the report are –

- Over 9,500 wild plant species are used by tribals. Out of this, 7,500 are used for medicinal purposes, 3,900 as edibles, 400 species as fodder, 525 species for fibre and cordages, 300 species as pesticides etc. Details are given in the Figure 1.
- Ethnozoological investigations were also carried out in 17 states. This shows that 76 species of animals are vital for tribal medicine and this includes 60 vertebrates and 16 invertebrates.
- Certain amount of research is also said to have been initiated to follow up claims by means of technical scrutiny in areas of medicine and nutrition.

While a large number of institutions participated in this survey and annual reports and consolidated reports of some of these institutions and published papers are available the main findings of the project are not available for public view. It is known that a final technical report has been submitted to the Ministry of Environment and Forests in 1998 (Pushpangadhan, P, 2002). However, the contents of this report are currently not available for public scrutiny. It is essential that the contents of the field survey should be available for the use of local communities as well as researchers after putting in place the satisfactory mechanism for protection and safe guarding the traditional knowledge. Details about this report are given in Annexure IV.

2. PRODUCTS OF ANIMAL ORIGIN USED IN TRADITIONAL MEDICINE

In traditional medicine, products of both plant and animal origin are widely used. We have made a reference in the earlier section to products of animal origin used by tribal communities. We are summarising below some information regarding animal products used in Ayurveda / Siddha systems of medicine.

FIGURE 1. UTILIZATION PATTERN OF WILD PLANTS BY TRIBALS OF INDIA

A. ANIMAL PRODUCTS USED IN AYURVEDIC SYSTEM OF MEDICINE

Ayurvedic formulary of India makes a reference to about 27 products of animal origin in use in Ayurvedic preparations. This include mammals, birds, reptiles, fishes, insects and other invertebrates. The variety of products derived from animals for use in ayurvedic preparations range from flesh and milk to feathers, semen, excudates etc. The use of full live animals as companions etc., also finds mention. Details are given in Annexure V.

B. ANIMAL PRODUCTS USED IN SIDDHA MEDICINE

A survey of the variety of animal products used in Siddha medicine has been made by a Siddha physician (Rajalakshmi, 2001). There has been a listing of about 148 species, which includes mammals, birds, reptiles as well as lower animals. There are 20 different kinds of animal products in use ranging from flesh, milk and include products such as feathers, bones and nails. Once again the use of live animals such as leech or doe also finds a mention. Details are given in Annexure VI.

C. ANIMAL PRODUCTS USED IN UNANI SYSTEM OF MEDICINE.

The Unani formulary of India makes a reference of about 35 products of animal origins in use in Unani preparations. This includes parts of mammals, birds, reptiles, fish, prawn, earthworm and other invertibrates. A few of the names are given in Annexure VII. (Khaleefatullah, S.2002)

RECOMMENDATIONS

Studies need to be undertaken in the following areas -

- Use of animal products by folk practitioners other than tribals
- Survey of animal products mentioned in various ISM texts. Products mentioned in the pharmacopoeia covers only a small part of ISM preparation currently in use.
- The sustainable use and harvest of many of these animals requires a detailed investigation and studies in the present day context. Traditional medicine practitioners have reported, for example, that their practice has been adversely affected and limited due to lack of availability / shortfall of animal products such as musk.

CONSERVATION OF SPECIES USED IN TRADITIONAL MEDICINE

Conservationists have generally seen themselves as working at cross purposes with practitioners of traditional medicine who are seen as consumers of a variety of species. In some cases, the relationship is one of great hostility since traditional medicine is identified as being the consumer of materials from species that are endangered or under threat. Typical examples are Tiger bone and Musk which are used in some traditions of Asian medicine (Rosser Alison, 2000) The First International Symposium on Endangered Species used in Traditional East Asian Medicine was held in 1997. This made a beginning in terms of prompting an understanding of the needs of these two groups. The Species Survival Commission produces a wealth of information but it appears that there is insufficient information to inform conservation decisions at the local level. It has been suggested that information on demand levels can be collected relatively easily by undertaking market surveys. In contrast, formal assessments of wild life population are generally more expansive and time consuming and hence they have been carried out only for a limited number of species (Rosser Alison, 2000).

3. ANALYSIS OF DATA FROM CONVENTIONS OF FOLK PRACTITIONERS

As we have pointed out earlier, there is very little systematic and detailed information and documentation regarding the folk medical traditions of India. Hence it is of importance to take note of some recent efforts where there have been attempts to gather information and inputs from a relatively large number of folk medical practitioners.

A. ANALYSIS OF DATA FROM 14 NATTU VAIDYA CONVENTION HELD DURING 1995-96

During the years 1995-96, fourteen conventions of folk medical practitioners was organised by FRLHT in Tamilnadu, Kerala and Karnataka (See Map 2). There were 14 meetings with participation of about 1,200 Nattu Vaidyas, spread from 96 taluks and 598 villages of the three states. Some of the information collected from the meetings is summarised as follows

- A majority of the Nattu vaidyas (39.5%) had less than 10 years of experience, while 27.1% had between 10 to 20 year's experience. Only a small number of Nattu Vaidyas namely 3.5% have more than 40 years of experience.
- In terms of training, by and large it is a family tradition with about half the total number of Vaidyas having learnt from their father or mother.
- It seems that the tradition is doing fairly satisfactorily with more than 75% of the vaidyas stating that they are propagating their knowledge to their students. It is interesting to see that while a large number of Vaidyas are propagating the tradition to family members, many are also teaching it to anybody interested.
- In terms of diseases treated there is a spectacular range in variety with the leading diseases being jaundice, fever, head and abdominal pain, cough, cold, asthma, diabetes, fistula and skin diseases.
- In all, the total number of medicinal plants mentioned as being used are 766 species of which *Adathoda zylanica*, *Ocimum tenuiflorum*, *Phyllanthus amarus*, *Eclipta prostrata* and *Acalypha indica* are the top five.
- In terms of source of the plants, major sources are in a decreasing order of importance – local collector, shops and self collection.
- In terms of plants that are difficult to get, 312 species have been mentioned with the plants, *Polygala glabra*, *Centella asiatica*, *Eclipta prostrata* heading the list.
- There is a list of over 400 plants that in the opinion of the Vaidyas can be grown in a home garden.

RECOMMENDATIONS

It can be seen that a number of actions can be initiated to strengthen Nattu Vaidya tradition based on the data from these conventions. Some of them are

- Honour and encouragement to be given for the propagation of the traditions

- Effort should be made to encourage and support the cultivation of difficult to obtain species.
- Effort should be made to support the cultivation of species identified as being suitable for cultivation in a home garden.

Details about the conventions are given in Annexure VIII

**MAP 2. LOCATIONS OF THE FOURTEEN CONVENTIONS OF FOLK
MEDICINE
PRACTITIONERS**

B. CONVENTION OF FOLK MEDICAL PRACTITIONERS, APRIL 2001, MADURAI

The Convent Centre for Development (CCD) based at Madurai had organised a three day convention of folk medical practitioners at Madurai between April 14th and 15th, 2001. The convention was attended by about three hundred delegates consisting of folk medical practitioners, institutionally qualified practitioners of Ayurveda, Siddha and Unani systems as well as raw drug collectors. About 60 organisations were represented in this meeting which drew delegates from the districts of Madurai, Kanyakumari, Tuticorin, Sivagangai and Chennai.

Vaidya K.Gowthaman, Ayurvedic Physician, made a presentation at the meeting regarding NBSAP. Discussions were held with folk practitioners, raw drug collectors and questionnaires were distributed to obtain inputs from them for the NBSAP process. The following are some of the observations and conclusions.

1. A large number of Nattu Vaidyas felt that a major problem facing them is the lack of honour and recognition for their work.
2. A majority of the Nattu Vaidyas used between 25 to 100 plant species and between 5 to 25 animal species for their treatment. However, there are some Vaidyas who carried out their treatment exclusively with plant species.
3. In terms of access to raw drug, they are obtained from raw drug collectors, raw drug shops, home gardens, hill-people, directly from forest. Currently, some problems are being faced in accessing raw drugs directly from forests.
4. Among the problems faced by the Nattu Vaidyas the following found prominent place – lack of recognition and honour in society, lack of any help from the Government, problems in obtaining information regarding as well access to drugs.
5. In terms of sustainable harvesting and conservation some of the suggestions made were –
 - a. Not collecting more than what is required.
 - b. Planting species whenever one harvests plants.
 - c. Creation of awareness among people regarding importance of medicinal plants.
 - d. Protecting herbs in protection centres.
 - e. Ban on exports.
 - f. Ban on grazing by goats in specified areas.
6. The following were some of the suggestions received in terms of action that can be taken –
 - a. Prohibition of slaughter of cows for meat.

- b Steps to increase availability of natural fertilizers and green manures.
- c Steps to protect forests against destruction.
- d Protection of herbs by NGOs.
- e Curbs on hunting of animals and birds.

C. FESTIVAL OF INDIAN MEDICAL HERITAGE, DECEMBER 2001, MADURAI

In December 2001, the Medicinal Plants Conservation Network (MPCN) of FRLHT organised a – “Mooligai Utsavam” which was a – “Festival of Indian Medical Heritage and Medicinal plants” at American College at Madurai. The meeting and exhibition was attended by nearly 12,000 people during the course of three days including – folk medical practitioners, rural women and youth, practitioners of ISM, manufacturers of Ayurvedic practice, etc. The meeting was sponsored by - Medical Plant Conservation (MPCN), Medical and Aromatic Plants Program in Asia (MAPPA), Tamil Nadu Forest Department, Arya Vaidya Nilayam, Madurai, National Dairy Development Board, Bangalore, Voluntary Health Association of Karnataka, SEVA, Madurai, Lok Swasthya Parampara Samvardhan Samithi, Coimbatore, National Innovation Foundation, Ahmedabad, Foundation for Revitalisation of Local Health Traditions, Bangalore, The American College, Madurai, Tamilnadu Voluntary Health Association and the Centre for Indian Knowledge Systems.

One session of the festival was devoted to presentation and discussion on the Health and Biodiversity Thematic section of the NBSAP. This session was held on 28th December. A presentation was made by A.V.Balasubramanian, Coordinator of the TWG on Health and Biodiversity. He presented an outline on the NBSAP process, methodology of work adopted by TWG on Health and Biodiversity, identification of major stakeholders and the broad recommendations and plants being considered by the working group. A discussion with inputs from the participants followed this. Mr. Mukund Maigur from the NGO – Kriyashilla Gelayur, Dharwad, presented songs on biodiversity. Concluding remarks were made by Mr. Utkarsh Ghate of FRLHT. A large number of forms were also distributed during the session to gather inputs from the participants. Subsequently, a few more presentations regarding NBSAP process and the work of the TWG on Health and Biodiversity were also made in some other sessions including – the session on quality control and standardization of ISM drugs and smaller informal gatherings of Nattu Vaidyas and rural women. The completed forms are being still received and the detailed analysis of the data is in progress.

SOME OF THE POINTS THAT WERE BROUGHT OUT BY THE PARTICIPANTS DURING THE DISCUSSION AND THE RECOMMENDATIONS THAT CAME UP ARE LISTED BELOW

- Transition from traditional pattern of crops to new crops can lead to loss of biological diversity and make bioresources necessary for health less available or unavailable. For example, in the traditional pattern of crops there were a number

- of insect species including crabs and snails that are found in the fields, which are now disappearing. Some regulation needs to be put in place to check such a trend.
- Efforts can be initiated by the State and Central Government as well as private bodies to recognize and publicly honour outstanding Nattu Vaidyas who are carriers of the traditions.
 - ◆ It appears that currently the contracts for the harvesting and collection of NTFP (Non-Timber Forest Produce) is largely given by the Forest Department to contractors. It was suggested that contract to collect NTFP should be given to local Communities including NGOs, Vaidyar Sangams
 - ◆ The forest department should also take up experimental studies and make detailed observations on regeneration of various plant species so that we may gather information regarding sustainable harvesting practices.
 - ◆ Efforts should be made towards the introduction of a certification procedure for all products that make use of natural products and bio-degradable products with the mark – “Bio-friendly” since this would provide a boost to such efforts.

IV. MARKETING OF WILD MEDICINAL PLANTS

A recent study (Datta S. K. 2001) has made a number of observations and suggestions about the current status and problems of collection and marketing of medicinal plants. The majority of the medicinal plant species (70 per cent) occur in the forest areas and the remaining 30 per cent are found in non-forestlands including lands under cultivation (A Ravishankar et al 1999). But, only a fraction of the resource (about 5 per cent) is gathered for marketing. The reasons for such poor collections are: (I) absence of direct market-linkage between the collectors and the consuming centres of the medicinal plants. The tribal people collect such items during the lean-seasons, i.e., when they are left with no other option of livelihood and they sell or exchange their collections for their daily needs; (ii) sporadic spatial distribution of the plants makes bulk collections impossible; (iii) inadequate knowledge about the medicinal values of many of the plants occurring locally is also responsible for poor collection. Erosion of phyto-medicinal knowledge base has taken place systematically over the years; and (iv) there has been shrinkage of common property resources (CPRs) and areas under forests. Population pressure and diversion of forestland for development activities are mainly responsible for such reduction in forest areas.

Supply Side Corrections

The supply side imbalances could be overcome by ensuring extraction of medicinal herb without depleting the resource base. To achieve this, it is needed to have: (I) well laid

out inventory of medicinal herb occurring in the wild; (ii) statistics of their incremental aspects for ensuring that only the periodic increments are removed scientifically; (iii) rejuvenation of the degraded forests with the regeneration of medicinal plants; (iv) cultivation of endangered and extinct species in forest nurseries and on degraded common properties (CPs). The provision of the Forest Conservation Act, 1988 prohibits the plantation of medicinal plants on forestlands without the prior permission from the government of India. Such provisions need corrections under the present context.

Demand Side Corrections

There are some successful institutional interventions in this aspect in different states of the country. One such example of intervention is that of the Kerala State Federation of SC/ST Development Cooperative. The SC/ST Federation is the apex body of Tribal Cooperative Societies (TCS) of the state. The government of Kerala has granted exclusive rights of collection of some of the notified items of non-timber forest products (NTFPs) to the TCS. There is a state level committee called NTFP committee, which determines the prices for different NTFPs for different stages, namely, 'collection charges', 'procurement charges' and 'sale prices'. The 'collection charges' are the minimum prices by which the SC/ST federation procures the produce from TCS and the 'sale prices' are the possible revenue that can be earned by the SC/ST federation from the sales of the produce. The SC/ST federation under its marketing strategy, sell some of the produce to the Pharmaceutical Corporation (IM) Kerala and the remaining part of the produce is sold through auctions. Studies have shown that the procurement of NTFPs through TCS has liberated the tribal people in Kerala from the clutches of the private traders (Philip Thomas and et al 1993). Another example of institutional intervention is that of the Gujarat State Forest Development Corporation (GSFDC). GSFDC appoints collection agents who collect the NTFPs from the tribal people at a price fixed by a state level committee. The state level NTFP price fixation committee has representatives from the tribal people, business community as well as GSFDC. The procured NTFPs are sold by GSFDC through open auctions. Studies show that the poor sections of the society have been gainfully employed during the non-agricultural season through such intervention (AP Misra 1996).

V. RELATIONSHIP BETWEEN HEALTH AND BIODIVERSITY

There are very few studies where there is definite data available to understand the link. We give below summaries of two such studies.

A. KYASANUR FOREST DISEASE (KFD)

Kyasanur Forest Disease, a viral disease transmitted by ticks, has been decimating two species of monkeys, the langur (***Presbytis entelus***) and bonnet macaque (***Macaca radiata***), and causing disease and something death in the village people since its discovery in 1957 in Sorab taluk of Shimoga district, Karnataka. The disease has gradually crept into the forested areas of neighbouring taluks of Shimoga district and neighbouring districts of North Kanara, Chikmagalur and South Kanara, and has appeared in five new foci. The monkey epizootics and the resulting human epidemics by

the virus has been attributed to the change in the ecology of the area, particularly to the destruction of the habitat by human interference.

Origin of KFD

Ever since the discovery of the disease an array of explanations were put forward without adequate scientific evidences, about the origin of KFD. After well founded studies on various intricate ecological aspects of the disease it was inferred that the artificial conditions created by human settlements have a direct bearing mostly on the multiplication and concentration of the vector tick **H. spinigera** which feeds on cattle and live in the interspace between the clearings and the primeval forests enclosing the villages. This has resulted in the latent enzootic infection circulating mainly through small mammals and ticks becoming patent monkey epizootics and epidemics (Boshell, 1969).

The sequence of ecologic events that led to the epizootic-epidemic outbreaks is enumerated below:

1. Increase in the human population resulting in the increased agricultural activity.
2. Clearance of the forest and conversion of the forest land into agricultural land.
3. Decimation of carnivores and wild ruminants.
4. Increase in the cattle population.
5. Thinning and opening the forests and rendering them suitable for cattle grazing.
6. Conversion of evergreen and semievergreen forests to teak and **Eucalyptus** plantations and rendering the ground suitable for cattle grazing.
7. Selective felling of the trees for industrial and commercial purpose and opening the forest canopy and rendering the forest floor suitable for cattle grazing.
8. Adaptation of **H. spinigera** to cattle and explosion of its population in the interspace between forest and village.
9. Increased contact of the monkeys with the forest floor due to decimation of the carnivores and opening the forest canopy.
10. Contact of the monkeys with the latent rodent-tick enzootic cycle of the virus.

Concluding remark

We quote the following from the above study -

The manifestation of the KFD and the decimation of the monkey in the aforesaid area is the result of habitat destruction. We have a habit of considering a species as an independent unit of ecosystem. We have to give up this prejudice and consider a species

as an inseparable integral part of an ecosystem. Even a slight abuse of an ecosystem will endanger all the constituent species and disintegrate it. If our present subjective endeavour of conservation of any species has to become an objective endeavour, protection of the habitat ecosystem is mandatory. Our primate fauna is predominantly sylvan and arboreal. They entirely depend upon the flora of the forest habitat for their food. Clear felling forests or converting the natural forests into plantations will destroy the habitat ecosystem with which the primates have evolved, and the dependent primate species. Primates are predominantly nonspecialised feeders and they shift their food intake from season to season in response to food availability. The shifting enables them to find suitable diet in any season and almost in any natural habitat. The so called selective felling of some species of food plants would break the annual chain of food plants and starve the monkeys to death or drive them off. We have a large commensal population of primates. They live by raiding food crops and are in perpetual conflict with man. They survive precariously on the religious altruism of the Indian people, which is gradually eroding. Trapping and extermination of monkeys has been increasing.

B. DEFORESTATION IN THE ANDAMAN AND NICOBAR – Its impact on Onge.

Hard data in terms of precise impact of deforestation on the health of a population is usually difficult to come by. The reasons are many such as – the lack of availability of bench mark surveys of a *before and after* nature, the complexity of factors impinging upon any population which makes it difficult to separate out the impact of bio diversity laws etc., However, in a few cases there is information available about the impact on forest loss on a population which makes it possible to take a close look at the relationship between health and bio resources / bio diversity. There is information available about deforestation that is taking place in the Andaman and Nicobar islands. (Seskharia, Pankaj, 2001). Andaman constitutes a group of about 350 islands and the Nicobar, 24 islands. Only 10% of these islands are inhabited by humans. It has been suggested that these islands hold a unique position with respect to their Flora and Fauna.(Saldanha, C.J 1989). At least 32 species and sub species of mammals, 95 bird species and 23 reptile species are unique to the group of islands. They have been identified as one of the hot spots of bio diversity in India. The Onge tribes are one of the 6 indigenous tribal communities in this area. Their population which was recorded as 678 individuals in the 1901 census has declined to a mere 101 individuals as of 1991. The Onges have fared somewhat better than the Andamanese whose population has declined from 625 in 1901 to a mere 28 individuals in 1991. In the case of Andamanese it is known that they suffered heavily due to epidemics such as pneumonia in 1868, measles in 1877 and influenza in 1896 and Syphilis – the tribals had no resistance to these diseases which they contracted from outsiders. Unlike the Andamanese, Onges appeared to be suffering on account of destruction of their forest and imposition of a way of life that is alien and insensitive to them. The only home of the Onge is the Southern most island of the Andaman group with an area of 730 Sq.km. The 1960s saw a massive increase in the population on this island and currently thousands of mainland Indians including refugees from East Pakistan and Tamils from Sri Lanka have been settled here. Over the last 35 years, about 30% of the island had been taken over by outsiders for settlements, agriculture, timber extraction operations and plantations. Even though 70% of the island

is supposed to be retained as tribal reserve, it is said that this status has been only on paper. About 20,000 hectares of the island was handed over to the forest corporation and it has been extensively logged in the last three decades. There has been reports that the Corporation has been violating the tribal reserve area. The imposition of a lifestyle that is totally alien to the Onges has also been damaging. For example, the Andaman Adim Janjati Vikas Samiti (AAJUS) which is the Tribal Welfare Board of the Andaman and Nicobar administration has a welfare scheme for the Onge. This offers doles in which they have items like rice and sugar which were never a part of the Onge diet. At one time it also included 250g of tobacco for each adult as a “Welfare measure!” (Awaradi S. A. 1990)

The Onge have a rich traditional knowledge of plants and animals. Some time back there were reports that the Onges had a traditional treatment for cerebral malaria which was claimed as a discovery by the ICMR without due acknowledgement to the source of this knowledge (Kothari, A and N. Pathak, 1998)

Many experts are of the opinion that unless drastic steps are taken which include the terminating of the forestry operations in the island the Onge will not survive as a viable and independent group of people.

VI. REPORT ON FIELD SURVEYS UNDERTAKEN IN GUJARAT AND RAJASTHAN STATES

Surveys were undertaken in Gujarat and Rajasthan states to gather information on the relationship between health and biodiversity. The objective of the surveys was to have an overview of the field reality from some selected areas focussing on getting information from those stake holders whose views are not normally represented or heard prominently in the policy making and planning process i.e., households, traditional healers and raw drug collectors.

A. GUJARAT SURVEY

The survey was carried out by CHETNA, Ahmedabad in the districts of Sabarkantha, Panchmahal and Navsari of Gujarat. Various voluntary agencies and other staff as well as the faculty and students of an Ayurveda College were involved in this survey. A summary of the findings and recommendations of the survey are given below

- The information was collected from the three districts of Gujarat named above. Panchmahal is in the Central Gujarat bordering the state of Madhya Pradesh. Sabarkantha is in the North Gujarat bordering the state of Rajasthan. Navsari is in the Southern Gujarat bordering the state of Maharashtra. Information was collected from a total of thirty villages in the three districts. Purposive sampling was done to obtain the required information. Local NGOs identified households, healers and herb collectors.
- Agricultural and cropping patterns had direct implications on food practices. More and more land is coming under cultivation of cash crops and there is

increasing use of hybrid seeds, fertilizers and pesticides. In all the three districts, there is a shift in the food grain intake from a traditional basket of nutritious foods to comparatively less nutritious food and grains. Pulse consumption has decreased. Communities report the change in the cropping pattern as main reason for the change in food practices.

- Communities still have knowledge regarding special foods that are to be used for infants, non-increase in child's weight, frequent childhood illnesses, puberty, pregnancy, foods for easy delivery, foods after delivery etc.
- There is also a wide amount of knowledge regarding diets to be followed during illness, diet rules, diets to be preferred or avoided during various seasons and diets during festivals. Information was collected about herbs used by households and 76% households in Sabarkantha and Navsari districts first resorted to home based care during illness.
- Information was collected from households regarding herbs used, who is consulted during an illness, impact of environmental degradation, plants which are not available and awareness regarding the environment.
- Information was collected from herb collectors regarding – types of herbs collected, difficulties faced by them, availability of herbs, marketing of herbs etc.
- Traditional local healers were interviewed and information was obtained from them regarding – reasons for practising, sources of learning, their clientele, availability of herbs and their views on commercialization of the use and preparation of herbs.
- Major recommendations of the study are presented below
 1. Formulate agriculture policy/programmes based on the local food pattern and ensure production of traditional food crops along with new hybrid crops and cash crops.
 2. Ensure availability of traditional food crops, particularly those, which are known to be rich in nutrition in local markets, Public distribution systems, Anganwadi, mid day meal program and hospitals.
 3. Create mechanisms for marketing of medicinal plants and regulatory bodies to regulate its functioning. Panchayat can be similar bodies at village level
 4. Create bodies for organization, regulation, upgradation and promotion of local healers
 5. Educate communities, health workers, and supervisors. Program planners and educators on the traditional foods and concepts of diet - time, seasonality and

festivals, role and importance of herbs in primary health care, importance of environment, impact of environment degradation on peoples health and the means for its conservation.

6. Set up small-scale pharmacies at district /village level to be managed by Panchayat and local women's groups.
7. Develop and disseminate updated information on traditional healing in local language. Initiate healer's newsletter and encourage networking.

B. RAJASTHAN SURVEY

- The field survey in Rajasthan was coordinated by CHETNA Ahmedabad in collaboration with local NGOs in Rajasthan.
- The study collected information from the Jhunjhunu and Tonk districts of Rajasthan. Jhunjhunu district is in the North of Rajasthan, neighbouring Haryana – this district has extremes in climate and is considered the hottest place in Rajasthan. Tonk district is in the Western Rajasthan near Jaipur. Information was collected from eleven villages in these districts.
- Information was collected from a total of 49 families – 25 from Jhunjhunu and 24 from Tonk districts using the procedure of purposive sampling. Key informant interviews were conducted with local healers, dais and herb collectors.
- There is a great diversity of foods that are still eaten by the communities today. These include nine cereals, eleven pulses, forty one vegetables and twenty two fruits in addition to non-vegetarian foods and milk products.
- There is a great deal of sophistication and nuances in food practices. For example, there are foods that are preferred or avoided at specific times of the day (lunch / dinner). There are also seasonal variations in terms of foods that are preferred or avoided in summer, winter and monsoon seasons. There are also foods that are adopted during different life stages ranging from infancy, childhood, slow growth, puberty in the girl child, pregnancy, for easy delivery, after childbirth etc. Knowledge is also available regarding foods associated with specific seasons.
- At the level of households, there is knowledge regarding the treatment and diet for a variety of conditions such as diarrhea, fever, jaundice, cold and cough, cholera, stomach pain etc.
- There are several changes observed in food practices during recent times. For example, while 88% families in Jhunjhunu district reported eating the same food since the last decade only 33% families in Tonk district reported this. The reasons contributing to changes in food practices were many such as – change in

cultivation practices, non availability of older foods in the market, changes in tastes etc.

- In terms of the use of herbs, information was also obtained regarding sources of herbs and problems in procuring herbs.
- There has also been changes in herbal usage for which the reasons listed were as follows
 - a. In the Tonk district – drought, scarcity of herbs, increased cost of herbal medicine and increased use of allopathic medicine.
 - b. In Jhunjhunu district, - scarcity of herbs, lack of information in herbal usage, cost and labour of herbal preparations and mentality of people “to get well soon”
- In both the districts it was felt that there has been an increase in incidence of illnesses as well as general weakness and a number of new illnesses have been reported which were not widespread before.
- Information was obtained from herb collectors regarding – the source of herb collection, the treatment of herbs, the management of herb collection, income from herbal collection as well as the problems that they are facing in the process of collection. Some of the suggestions made by them for improving the situation are listed below.

TABLE 18. MEASURES FOR IMPROVING THE SITUATION

Community	Market	Panchayat	Government	NGOs	Others
Cultivate more trees in fields and waste Lands	Regulation of price of herbs	Trees/Plants should be cultivated	Give funds for cultivation of herbs	Create awareness on use of herbs in communities	Foreign funds should be used for herbal cultivation and production
Use more herbs	Herbs sold at affordable price	Stop felling of trees	Provide technical input in herbs cultivation, storage and production		Develop a market and fix price of herbs
<i>Protect</i>		Fix the price of herbs and			

<i>herbs</i>		raw materials			
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- The general suggestions that were made by people for the conservation of biodiversity are listed below in the following table.

TABLE 19. MEASURES TO CONSERVE BIODIVERSITY

Self	Organization	Panchayat	Women's Group	Others
-Cultivate and protect medicinal plants -Prohibition on cutting trees -Growing more trees -Promotion for cultivation and protection of trees	-Create awareness among people on how to use and maintain herbs -Provide support to the communities for protection and protection of medicinal plants -Formation of pressure groups -Propaganda to save forest and tree gardens	-Prohibition on cutting trees -Law to stop cutting of trees -Protection and cultivation of trees -Make gardens with the involvement of villagers -Involving school children and elders to cultivate and protect trees	-Awareness among women and children on advantages of medicinal plants and its protection	-Campaign on 'save the trees' -Decrease population -Provide support to the organizations for protection and cultivation of trees/forest -Emphasize herbs plantation on waste land of the villages -Formation and selection of committee to protect herbs

CHAPTER IV

ONGOING INITIATIVES

Today Biodiversity and Traditional Knowledge are both “hot” subjects and for a variety of reasons they are on the agenda of a very large number of individuals, NGOs, Corporates and Government departments who are “seized of this matter”. We are providing below an overview of some of these efforts

I. INITIATIVES IN THE NON-GOVERNMENT SECTOR

We are giving below an overview of efforts of four different agencies – these are only representative and by no means exhaustive

A. TRIBAL MEDICINAL TRADITION AT KARJAT IN WESTERN GHATS, INDIA.

The Academy of Developmental Sciences (ADS) has been working since 1977 in the Karjat tribal block that is located in the Karjat taluk in Raigarh district in Western Maharashtra. They have carried out a detailed documentation of the knowledge possessed by the tribals in this area who are predominantly Katkari tribals. Some of the features of the documentation and the highlights of the results are summarised below. This summary is based on a book produced by ADS on this subject in Marathi. (See Figure 2).

- ADS has on its staff, traditional medical practitioners, both institutionally qualified and non-institutionally qualified practitioners. They have also interacted closely with some outstanding ayurvedic physicians of India based at Pune and Mumbai, Maharashtra.
- The Karjat tribal block has a population of about 30,000 persons distributed in 44 tribal hamlets. They are predominantly Katkari tribals with also a presence of Thakur and Mahadev koli tribals
- There are about 10 categories of traditional practitioners that have been recorded which are the following - ‘Vaidu’ - General physician, ‘Suin’ - Gynaecologist, ‘Potdhari’ - Assistant Gynaecologist, ‘Hadvaidu’ - Bonesetter, ‘Dagvaidu’ - treats by branding, ‘Visha chikitsak’ – treats ailments caused by poisons, ‘Bhagat and Bhagatin’ – treat mental ailments for men and women respectively, ‘Mantrik’ –

treat people who are haunted and mental ailments and 'Pashuvaidya' - veterinary doctor.

- Karjat Taluk has approximately 100 general practitioners, 225 gynaecologists, 250 assistant gynaecologists, 40 orthopaedics, 50 Dagvaidus, 30 Vishachikitsaks, 30 Bhagat, 20 Bhagatins, 15 Mantriks and 50 veterinary doctors
- The natural resources used in treatment include 504 species of plants consisting of 163 trees, 236 shrubs and 105 creepers
- They also make use of 34 animals and about 30 birds besides which the use of about 10 minerals has been recorded.

FIGURE 2. COVER PAGE OF THE PUBLICATION BROUGHT OUT BY ADS ON THE TRIBAL HEALTH TRADITIONS OF THE KARJAT AREA (IN MARATHI)

- They treat a wide range of disorders ranging from common ailments and fever to skin diseases, conjunctivitis etc.
- They use 7 types of food grains and about 46 vegetable varieties including cereals, fruits, roots, tubers and leafy vegetables. The food also includes about 15 birds and animals besides several species of fish.

This is a remarkable example of stupendous knowledge of flora and fauna that is found even in a relatively tiny population in a tribal area and a wide range of plants and animals used for food and medication. ADS has also very successfully experimented with the use of institutionally qualified practitioners of Ayurveda for strengthening and revitalising folk health systems. Details regarding this work are given in Annexure IX.

B. THE KITCHEN HERBAL GARDEN PROGRAM IN SOUTH INDIA

The Kitchen Herbal Garden (KHG) program is an extremely large outreach programme of FRLHT. It targets resource poor rural women to help them to grow a package of 15-20 medicinal plants in their own backyards. The programme is being implemented by a network of NGOs in Kerala, Karnataka and Tamilnadu who have set up hundreds of thousands of KHGs. A bench mark survey of this programme was taken up in consultation with Professor Rehmatullah, a community health specialist at Madurai to study the impact of the programme in eight Southern districts of Tamilnadu.

The survey resulted in the following findings: (FRLHT, 2001)

- 95% of the adopters of KHG package belonged to socially deprived sections such as dalits (25%) and backward communities (70%)
- 76% of the adopters were economically very poor (35%) and poor (41%)
- 91% of the households paid the full cost of medicinal plants supplied
- 70% of the KHG users reported complete relief through home remedies as first response to simple complaints such as cold, cough, fever, etc. encountered at home
- 69% of the users of home remedies were women and children.
- 45% of the KHG adopters were non-members of women self-help groups through whom the self-help package was implemented.

RECOMMENDATION RELATING TO THE KHG PROGRAMME

The following is the summary of recommendations that have been made relating to the KHG programme.

- Increase populations that have knowledge about home remedies

- Create awareness that home remedies are the first line of action for ill health. Only if there is no alleviation of symptoms, after four / five days should an outside physician be consulted
- Mainstream (allopathic) physicians require pharmaceutical and pharmacognosy training on medicinal plants. The Government should come with regulations for incorporating these in regular medical training
- A Supreme Court order prohibits doctors from prescribing drugs from other systems. Although several doctors are convinced about the efficacy of traditional medicine, legally they cannot prescribe. Some sort of advocacy is required to change this.
- Focus on a few common complaints initially
- Undertake clinical trials for these few common complaints
- Target the program on common complaints affecting women and children
- Use concepts from social marketing for designing further expansion
- Bring in nutritional plants in the medicinal plant packages
- Analyse the replicability problem
- Clinical trials can validate simple medicinal plant based treatments, for common complaints. This can then be standardised and sold as packets in tea shops (like in the case of the Oral Rehydration therapy).

C. LOK SWASTHYA PARAMPARA SAMVARDHAN SAMITHI

In 1986 a group of NGOs involved in strengthening and revitalising traditional medicine held a convention in Kashele in Karjat Taluka of Maharashtra to form a nationwide network. The initiative was taken by the Academy of Development Science at Kashele where it had been working for over ten years. The nationwide network has been operating under the name of LSPSS (Lok Swasthya Parampara Samvardhan Samithi). It has been involved in a large variety of activities including – strengthening the resource base of medicinal plants with particular emphasis on making plant resources available for households and local healers, organising local, state and nationwide conventions of folk medical practitioners, bringing out newsletters, magazines and monographs in English, Hindi and various regional languages, giving fellowships for students interested in continuing with folk medical traditions in a Gurukula pattern etc. LSPSS has been one of the most influential movements in this area and it has also been conducting several training programmes for households, NGOs as well as folk medical practitioners. A special feature of LSPSS's activity has been to recognize the interdependence and symbiotic relationship between folk practices (Lok Parampara) and the institutionally qualified practitioners (Shastric Parampara) and the manner in which it has used the

Shastric Parampara for strengthening and revitalising folk tradition. It has also been a spring board for the formation of a large number of other institutions and organisations that have been inspired to take on work of a similar kind in specialised thematic or geographic areas.

D. SETTING UP VEGETABLE GARDENS INTEGRATED WITH HERBAL GARDENS

The Centre for Indian Knowledge Systems (CIKS) is an NGO based in Chennai, working on traditional agriculture and healthcare systems. For over three years, CIKS has been implementing a programme for conservation of indigenous varieties of vegetables. Some features of the programme are –

- It is being implemented in five blocks of Kancheepuram district in Tamilnadu and at the pilot stage it involves five hundred families.
- Each family has set up a kitchen garden where they are conserving indigenous varieties of vegetables. Currently, 70 varieties of twelve different vegetables are being conserved.
- Surveys have indicated that each family gets nutritional supplementation that is estimated to be to a tune of atleast Rs.2,000/- per year in addition to which there is also a small supplementary income generation.
- The objective served by the programme are biodiversity conservation, nutritional supplementation and a small extent of supplementary income generation.
- It is an all women programme with the specific intention of producing vegetables for home consumption rather than for the market place.
- A few of the villages have obtained self sufficiency in seed production.
- Currently CIKS has started to undertake the vegetable conservation programme with the Kitchen Herbal Garden programme in its own field area as well as in collaboration with FRLHT in their field areas.

E. BIODIVERSITY REGISTER

Recently several efforts have been made to document knowledge and perceptions of people about Biodiversity and conservation through – “Peoples Biodiversity Registers”. A series of such efforts in various parts of Karnakata have taken place with the active involvement and guidance of Professor Madhav Gadgil of the centre for Ecological Sciences at Indian Institute of Sciences, Bangalore. For example, the People’s Biodiversity Register at the Mala village of Karkala Taluk in Karnataka presents some interesting details (Achar, K.P., 1997). This village has a population of slightly more than 5,000 persons and has about 900 households. As per the biodiversity register the knowledge possessed by villagers is quite amazing and it is summarised below.

- 266 flowering plants
- 37 common medicinal plants
- 29 mammals
- 58 birds
- 18 reptiles
- 7 amphibia
- 12 fishes

F. CENTRE FOR HEALTH EDUCATION AND TRAINING IN NUTRITION ACTION

The Centre for Health Education and Training in Nutrition Action (CHETNA) has been active in the area of action research with respect to Women's Health and Nutrition. LSPSS and CHETNA initiated a study on traditional health practices in 12 states of India in collaboration with 26 field NGOs. More than 2600 women were interviewed. Ayurved was used as a reference to understand people's practices. The findings have been documented in the form of a book "Her Healing Heritage" (1996). The information is used to strengthen safe motherhood interventions by CHETNA. As a member of Shodhini network (see below) CHETNA conducted a study on herbal medicine in gynaecology. A total of 320 herbs used by local healers were collected and some of them were used for treating common gynaecological illness with the help of trained health workers. CHETNA has also been involved in an effort to empower self help groups and create health awareness with assistance from the Ministry of health and Family welfare, Government of India, in collaboration with WHO. They have initiated a pilot project in thirteen states. Indigenous health and healing practices are integrated in the modules developed for state, district and village level trainers. The modules have been translated in eight Indian languages.

G. SHODHINI AND THE WOMAN AND HEALTH INITIATIVE.

In the late 1980s, concerned about the rapidly vanishing local health traditions, SHODHINI, a network of women's health activists came together in search of a women

centered approach as an alternative system of healthcare. As a result of an eight-year process they came out with an interesting compilation of plants giving a practical assessment of their medical value based on experiences when using these plants in treatment across the country. The results of their efforts are compiled in an interesting publication entitled – “Touch me, Touch-me-not” (Gupta, Anu et al, 1997).

The efforts of SHODHINI group prepared the background for the subsequent emergence of the WAH (Women and Health Initiative). WAH Initiative emerged out of the concern that the primary health care concept of today failed to consider gender issues and the specific health needs of Women in the provision of healthcare. The beginnings of WAH could be traced to 1992 when critical stakeholders from the national level came together in Surajkhanda to review primary health training needs in India. It was collectively decided that capacity building for women in primary healthcare management was the need of the hour. Although it began with a focus on training it has expanded over the years to include the goals of advocacy and networking. In 1999 there was a national consultation on – “Towards comprehensive women’s health policy and programmes”. Subsequently, the papers presented in this meeting along with several additional inputs have been compiled together in an interesting volume entitled – “Towards comprehensive women’s health program and policy” (Khanna, Renu, Mira Shiva and Sarala Gopalan, 2002). This volume also incorporates reviews of SHODHINI experiences, the WAH perspective on TSMs for women’s health and a critique of the draft national ISM policy. These have been used in the later sections of this report.

II. GOVERNMENT INITIATIVES

A. DRAFT ISM POLICY OF THE GOVERNMENT OF INDIA

The Ministry of Health and Family Welfare of the Government of India has made available the – “Draft National Policy on Indian Systems of Medicine – 2001” at its website <http://indianmedicine.nic.in>. It is stated in the title page that the documents is the first draft of the National Policy and the strategies have been suggested by different stakeholders and do not as yet represent Governments decision on these matters. It is also stated that a final ISM policy will be prepared on the basis of comments received including response from Central Government, Ministries and State Governments. The document is 37 pages long and it is not being reproduced here since it is available at a website. However, a two page summary of the document that has been provided at the end of the document itself is reproduced on Annexure X.

B. WAH! NETWORK COMMENTS

We are summing up below, the comments in this document by the WAH (Women and Health Initiative) (Sadgopal, Mira, 2002)

A major shortcoming of the ISM Policy according to the WAH! Network is that it fails to link up with the content and aspirations of NHP 2001. Another area of concern is that the policy as a whole lacks sensitivity to ‘gender’ as a factor that significantly affects ISM education, practice, research and industry. Today, ‘gender’ is just as important as class,

caste and the ‘global marketplace’ as a factor in health and ISM development. ISM does not lack in offering methods for averting female births, postponing menstrual periods for spurious (or religious) reasons, or in promoting skin-deep ‘beauty’ for women. The ISM Policy also does not take into account that reorientation of medical education needs to be informed, in theory and in practice, by regional variations in natural resources, textual and local traditional heritage, and residing expertise. For instance, Kerala has a rich tradition of ‘internal purification’ that is distinct from classical Ayurvedic *panchakarma*. There also exist many ancient texts in the Malayalam language. However, these find no place in the new syllabus in Kerala, as it is uniform for all states. In addition, the teaching pattern for ISM is currently the same as for the modern Western system. The scope for this needs to be widened to incorporate different methodologies that are partially drawn from ancient Indian teaching traditions. In this context, the predominance of Ayurveda over the other ISMs and over LHTs needs to be corrected and appropriate importance given to each stream of ISM. A definite plan for the revitalisation of LHT is required, including commonly owned and run village herbal gardens and pharmacies so that people have ready access to traditional primary health care materials. The traditional *dai* or midwives find no mention in the Policy, nor is there any programme for reinstating and standardising their training according to TSM perspectives and experience. The *dai* midwifery tradition is still highly respected in various regions – even today, *dais* and other women manage up to 80 per cent or more of births in both rural and urban poor communities. The issue of recognition and legal sanction of local healers’ practice has been entirely ignored. A great problem faced by rural healers is their lack of recognition or legal sanction to practice. Some provision is needed to give them legal status without making them so – called ‘doctors’. In addition, as WAH! Points out, gender and empowerment issues of women and marginalised local communities *must be brought to bear strongly and visible* on both the NHP 2001 and ISM Policy and in all the health programmes – otherwise fulfillment of the goals cannot be optimised. In the Draft ISM Policy the goals themselves need to be concretised by fixing specific quantitative and qualitative indicators of achievement *in every case*.

C In this context it is also useful to reproduce some specific recommendation for policy changes suggested by WAH (Gangadharan G.G. et al 2002)

Table 20: Recommendations for Policy Change and Programme Strategies	
Areas of Concern	Practical Steps
Official recognition of practitioners and health – workers in the Traditional Systems of Medicine	Find ways to recognise and use local expertise and experience available with traditional practitioners. For example, the government might consider instating a graded registration system for TSM practitioners (A = graduates, B = diploma holders, C = recognised local healers, with specific roles).
Evaluation of TSM	Evaluate TSM therapeutic frames in order to select

approach, skills and therapies.	approaches and therapeutic measures that can be easily and economically adopted for wider public use.
Mainstream orientation programmes for TSM practitioners – specific using their own knowledge and resources	Instate orientation programmes for registered TSM practitioners to involve them in the mainstream health programmes..
Public education (and demystification) about TSM.	Educate the public about the role and value of TSM in promoting and sustaining health, and to break the myths and misinformation spread by vested interests.
Acknowledgement of TSM in shift of research priorities and methodologies.	Bring about a shift in research priorities and methodologies acknowledging the foundational principles and worldview of TSM so that it can contribute to the world of medicine.
Protection and conservation of medicinal plants and health practices.	Build and maintain local databases of medicinal plants and practices used in TSM; disseminate this information appropriately for use by communities, schools, practitioners and researchers.
	Restrict the indiscriminate use of medicinal plants by industry.
	Stop multinational companies and other vested interests from appropriating our traditional knowledge and resources.
Promotion of wider utilisation of ISM formulations.	Use state resources to promote production and marketing of researched and evaluated TSM medicines.
	Make available TSM remedies in simple, locally packaged form for public and primary health care systems.

The Indian Commission on Health in India (ICHI) constituted by the Voluntary Health Associations of India (VHAI) had commented on the draft ISM policy (Shankar, Darshan, 2001, November). In the following section, we are reproducing these comments which have been made by Darshan Shankar of FRLHT with a few additional points that have been made by A.V.Balasubramanian of CIKS.

COMMENTS

- 1.1 This is the most comprehensive post independence statement on Indian Systems of Medicine by the Government of India. The draft plan and policy has touched upon all the issues critical for upholding the three main pillars of ISM sector, viz., (a) its natural resource base, (b) its traditional knowledge base and (c) the development of institutions that can carry the Indian Medical Heritage forward.
- 1.2 It has recognized critical areas not addressed previously by any government policy or programmes, viz., Good Manufacturing Practice, Good Clinical Practice, Certification Laboratories, Medicinal Plants Utilization (Demand and supply), regulations for nutraceuticals and food supplements, export of ISM education, export of ISM products and services, revitalization of local health traditions, research on epistemology of ISM, Veterinary Care and IPR.
- 1.3 It is also very encouraging that the policy has been put up for public scrutiny on a web site and the government is receptive to critical suggestions

2. Policy must address key concerns of Society

The crafting of a national policy for Indian Systems of Medicine must explicitly state and address key social concerns in order to enjoy public support. ICHI has articulated five major national concerns as below that could be adopted in the national ISM policy.

- (1) The concerns of ISM scholars regarding the neglect of the theoretical foundations of ISM and consequently, the lack of creativity in the traditional medicine community.
- (2) The concerns of social activists about the extremely limited contribution of ISM, (due to absence of policy and programme support) both from its codified and folk streams, to public health in India, in spite of the vast numbers of practitioners and the wealth of traditional system of health care.
- (3) Growing global interest in medical pluralism, expressed in the form of the complementary and alternative medicine movement, and the role that the ISM can play in shaping this global wave
- (4) The aspirations of the Indian herbal industry to becoming a world player.
- (5) The concerns of health professionals about the strategy for the popularizing of Indian systems of medicine domestically and in the West by generating scientific evidence for ISM claims.
- (6) The concerns of conservationists regarding the severe erosion in the natural resource base of the ISM and the need to urgently conserve medicinal plants.

3. Critical suggestions:

- 3.1 It is important for the national policy to recognise that the term "Indian Medical Heritage" or Indian Systems of Medicine (ISM) includes both codified systems like Ayurveda, Unani, Siddha, Yoga and Swa Rigpa (Tibetan) as well as diverse eco-systems and ethnic community specific, folk systems of health care.

- 3.2 The policy should be clear on role of government as 'facilitator' not 'actor' or 'manager' of the developments in the ISM sector. The policy should explicitly state that it recognizes the need for active participation of both government and non-government organizations in all key areas of ISM, viz., - research, training and extension services. Public investments in the sector today are directed largely towards ineffective government organizations and this skew needs to be corrected. The best of policies if badly implemented will not be fruitful. A major weakness of policy is that bulk of public funds are being invested into State and Central Government institutions of research, teaching and extension. These institutions have not shown great results in last 30 years. The policy should, therefore, invest 50% of its funds in reputed non-government institutions of research, teaching and extension.
- 3.3 The policy needs to emphasize that it will provide support for conservation of medicinal plants to the same extent as for cultivation, because conservation alone can ensure long-term availability of the genetic diversity, whereas cultivation can meet more immediate needs of raw materials. 'Conservation' serves as the backbone for sustainable cultivation and cultivation will reduce pressure on wild populations. Hence both need support. The draft policy is clear about support for cultivation, but vague about support for conservation. The Policy needs to recognize that "conservation of wild population of medicinal plants" via establishment of a network of "in situ forest gene banks" for medicinal plants is the most cost effective solution. There is no need to expand the 3 cold storage gene banks. These are adequate for the purpose of serving critically endangered species that can no longer be conserved in nature. The current programme of the ISM department for promoting "herbal gardens" lacks focus. India needs a national network of taluka / district level ethno-medicinal plant gardens to conserve all the good old species of plants known to the ethnic communities of India. This needs action at Taluka and District level. The gardens may be managed by the ISM colleges and NGOs. This programme should be supported by Central and State Governments.

The Kitchen Herbal Garden programme through which medicinal plant based home remedies can be offered as a primary response within the households has proved to be very successful as a pilot project that was being implemented in South India (described elsewhere in this report). This may be considered as an additional strategy for making use of medicinal plants for preventive and promotive health in rural areas at the household level.

It is important that Government or Medicinal Plants Board does not end up buying with public funds medicinal plants grown by cultivators via 'buy-back guarantees' and support prices and incur potential losses in storage and sales; rather it should facilitate buy back guarantees directly by manufacturers to cultivators through practical incentive schemes.

- 3.4 The ISM Policy should recognize that "health security" and "livelihood needs" of the community require as much support of the government as research, production and export of herbal products.
- 3.5 The Policy should state that it will encourage relevant application of ISM epistemology to the same extent as collaborative research with western bio-medicine. Although the policy has recognized the need for research on fundamental principles, it should be spelt out that the focus of research should be on exploring "contemporary applications" in areas like –
- clinical research
 - new drug development
 - adding new plant sources to materia medica
 - on practical methods for measurement of ISM parameters that can be used for standardization
 - on development of diagnostic protocols for priority diseases
- 3.6 The Policy should recognise the need to support work on Vrکشayurveda (i.e. Traditional Indian Plant Science) as much as for Veterinary Medicine (Mrgayurveda).
- 3.7 There is not sufficient focus on IT applications in the Policy. It is important that the policy encourages data-bases and expert systems on plants, formulations and diagnostics. Such databases will contribute to creativity and efficiency of Indian systems of medicine in research, teaching extension and with respect to IPRs.
- 3.8 The IPR subject should be addressed in the policy not only for prevention of false patents, but also for promoting good patents for innovations by Indian Systems of Medicine (ISM) community.
- 3.9 The Policy should clarify that Drug Standardization for ISM should be based on use of modern laboratory tools to interpret ISM parameters, else the standards will not contribute optimally to quality of ISM drugs.
- 3.10 Given the high morbidity due to contaminated drinking water, the programme to promote 'safe drinking water' based on ISM traditions of drinking boiling and herbally treated water is a commendable idea.
- 3.11 The draft document makes a reference to ancient Medical manuscripts and states that there is at present no complete catalogue of these manuscripts in India and in

various other parts of the World. In this connection, it is important to note the following –

- a. The Sanskrit department of the Madras University has been implementing since 1950, the – “Catalogus-Catalogum” project which was started with the objective of making an alphabetical listing of all Sanskrit manuscripts in public collections all over the world. The project has completed the cataloging task and as of now fourteen volumes of the catalogue have been published. This would provide an excellent starting point from which one can begin the listing and analyzing of manuscripts with suitable updating.
- b. Similarly, some years ago, the Tamil University at Tanjore, Tamil Nadu had compiled a listing of all Tamil manuscripts in public collections all over the world and this can serve as a starting point for traditional medical literature in Tamil. Similar efforts may have been initiated in other areas and languages of India more recently and these need to be looked into.

3.12 The draft document makes a reference regarding medical pluralism and exposing the modern medical graduate to Indian Systems of Medicine. This is indeed an excellent thought. However, it needs to be undertaken in an atmosphere of sufficient mutual respect between two traditions that have their own independent foundations, theories and methodologies. Also this program of exposing medical personnel to traditional medicine should also be extended to medical personnel already in Government service starting from the ANMs and various officials of the medical services.

4. On Goals:

Whereas key issues and areas have been identified and recognized, it is important for a policy statement to spell out explicitly the major goals of the ISM policy that might be achieved in the next 10 years or so. The spelling out of goals is important in order that there is clarity in the interpretation of the policy and consequently effectiveness in its implementation. Articulation of goals will also promote accountability because the performance of the government can be measured in terms of the accomplishment of the goals.

One can infer from the document that 9 major goals are implied in it. The formulation of goals (as given below) has been attempted by ICHI-based on the draft policy.

- (1) To promote quality medical education in all the Indian Systems of Medicine via non-government and government institutions
- (2) To promote such applications of ISM epistemology that are relevant "contemporary" needs of the medical community.
- (3) To promote via non-government and government initiatives collaborative research with western bio-medicine in "prioritized" medical areas in order to

- foster: (a) mutual understanding, (b) wider usage of ISM products and services domestically and globally.
- (4) To promote functional integration of ISM and western bio-medicine health services of government and non-government organizations at primary, secondary and tertiary levels of health care in order to usher in an uniquely "Indian" System of Medicine.
 - (5) To promote the 'health security' of rural and urban poor via revitalization of local health traditions and promotion of safe and effective traditional health practices of relevance to primary health care and to promote livelihood security of the small and marginal farmers and women by encouraging their participation in cultivation and processing of medicinal plants via community-based enterprises.
 - (6) To serve consumers of Indian herbal products by introducing GMP and GCP standards.
 - (7) To encourage growth of the Indian Systems of Medicine Industry via private and community based enterprises to 10 times its present turnover both in respect of domestic and export markets.
 - (8) To promote in situ conservation of the medicinal flora, fauna and mineral diversity for ensuring long-term survival of the country's natural resource base and to encourage large scale cultivation of medicinal plants.
 - (9) To prevent violation of IPR of folk and codified medicinal systems by putting the knowledge into public domain in a form that is internationally accepted and to encourage "innovations" by the folk and codified ISM community by facilitating their recognition under IPR systems in India and abroad.
 - (10) There should also be coordination at the local level (PHC level) between the Ayurvedic Mobile Dispensaries and the PHCs.

GAPS IN 'MEDICINAL PLANTS' RELATED PROVISIONS OF THE DRAFT INDIAN SYSTEMS OF MEDICINE (ISM) POLICY OF THE GOVERNMENT OF INDIA

Since the provisions relating to medicinal plants are of special interest to us in the context of biodiversity conservation, we reproduce below the comments on these provisions offered by Darshan Shankar of FRLHT (member of the TPCG of NBSAP)

Introduction

The draft ISM policy of the Government of India has rightly identified medicinal plants as one of its thrust areas. However, a close reading of the Policy reveals that the Policy

needs to be better informed about the medicinal plants scenario in the country. Some of the important features of the draft policy are -

Cultivation : The draft Policy does adequately recognize the need to encourage cultivation of medicinal plants and has suggested a focus on 28 species for immediate cultivation. The Policy also seeks to register both cultivators and traders in order to bring about accountability and foster quality consciousness. It also seeks to provide technical and financial support for R & D on cultivation, post-harvesting and processing technology.

Marketing : The draft policy has identified promotion of exports as an important thrust area including establishment of an export authority.

Coordination mechanism : It has recommended creation of National Medicinal Plants Board (which has been constituted) to facilitate production, storage, procurement, marketing and supply of medicinal plants to the pharmaceutical industry. The main stated purpose of the Board is to serve industry. The Medicinal Plants Board has been made responsible to assess the domestic demand and supply position.

Conservation : **The draft policy has made only one recommendation on conservation, viz., the establishment of three “more” gene banks.**

CRITICAL COMMENTS

On the role of Medicinal Plants Board : There is undoubtedly a crying need for a co-ordinating mechanism to bring together different government departments, Industry, NGOs, ISM associations, etc. associated with the medicinal plants sector and hence the idea of the Board is relevant. But the stated purpose of the National Board to only serve Industry needs limits its purpose. Given the large number of non-commercial users of medicinal plants (several million households and over a million folk healers and 500,000 licensed ISM practitioners), the Board should be asked to broaden its mandate and identify the needs of these users and serve them through well-designed interventions.

On Cultivation : The draft Policy does not centrally address the issue of ‘why cultivation of medicinal plants’ is not happening on an appreciable scale. The real reason appears to be that 90% of the requirements of the industry comes from wild cultivation. The market price of wild produce is cheaper than that of the cultivated plants and, therefore, whereas the farmers as well as the forest corporations are willing to grow medicinal plants on a commercial scale, they do not do so because of non-remunerative prices. The policy should, therefore, have recommended crafting of an intervention that will make the prices of wild produce equal or higher than that of cultivated produce. Today, cultivation happens only for those species (less than 20) where demand exceeds wild supply or for those species, which are no longer available in the wild. For the rest of the species, a substantial shift from wild collection to cultivation will only take place, if the price of wild supply becomes equal or higher than cultivated prices. There are around 660 botanical entities in all-India trade that are known to be collected from the wild.

On Conservation : The policy is extremely weak on its recommendations related to “conservation” of inter and intra-specific diversity of medicinal plants. As is well known, no country can have a sustainable cultivation strategy for any species without ‘conserving’ its germ plasm. The most cost effective way for conserving genetic diversity of medicinal plants is by establishing a network of forest-based in situ gene banks which contain wild populations of the medicinal plants diversity of the country. The policy has not recognized the urgent need for “in situ” conservation and has instead recommended a very expensive solution of establishing three new cryo- preservation gene banks. Cryo-preservation banks, in the conservation context, can at best serve as a back-up measure for conserving those species that cannot be maintained in their natural habitats, but they cannot fulfill the role of in situ conservation. Creation of three ‘new’ banks may be unnecessary because several cryo-preservation facilities already exist in the country in agricultural universities, CSIR, DBT and ICAR institutions.

B. TENTH FIVE-YEAR PLAN

The Planning Commission of the Government of India has released the – “An approach paper to the tenth five year plan (2002-2007)” in September 2001. It is significant that the approach paper is available on the website of the Planning Commission for all to see and comment. It has a brief reference under the section – “Health” to Indian Systems of Medicine and Homoeopathy. (Section 3.69) which states that -

There are six lakh practitioners in Indian Systems of Medicine and Homeopathy in the country. They will be provided with appropriate orientation/skill upgradation through CME rogrammes, mainstreamed and utilised in improving access to health care coverage under the national programmes. Efforts will be made to fully implement the recommendations of the Planning Commission’s Task Force on preservation, promotion and cultivation of medicinal plants and herbs, ensure availability of good quality ISM&H drugs at affordable prices within the country and fully realise the export potential for these drugs and formulations.

C. TASK FORCES ON PRESERVATION, PROMOTION AND CULTIVATION OF MEDICINAL PLANTS

The Planning Commission has set up a task force on the conservation and sustainable utilization of medicinal plants. The report of the task force is available in the website of the Department of Indian Systems of Medicine of the Government of India (<http://indiamedicine.nic.in/html/plants.htm>). However, we have reproduced the Executive summary of this task force as well as the 9th chapter of the task force report which provides the conclusions and recommendations of the task force in Annexure XI. The following comments are offered regarding the task force (Shankar, Darshan 2001)

1. It is significant because “Medicinal Plants” resources which is one of the country’s assets are receiving attention at such high policy level.
2. The economic analysis and projections in the report lack rigour. The botanical data in the report is sketchy and incomplete.
3. While utilisation and cultivation has been emphasized the need for in situ conservation of inter and intra specific diversity has not been sufficiently understood.
4. Involvement and benefit sharing with local community, women, traditional healers has been given a by pass and the report is oriented to big corporate players and exports.
5. The task forces also explicitly recognises that Indian Systems of Medicine functions through two streams namely – the folk stream and the classical stream.
6. It recommends the cultivation of 25 species of plants which it says are – “in great demand” and it lists some details regarding the cultivation of the species.

D. NATIONAL BIORESOURCE DEVELOPMENT BOARD

Hon'ble Finance Minister had, in his Budget Speech 1999, announced the setting up of a **National Bioresource Development Board** (NBDB) under the Chairmanship of the Hon'ble Minister of Science & Technology. The terms of reference of the Board are as given below :

1. To decide the broad policy framework for effective application of biotechnological and related scientific approaches for research & development and sustainable utilization of bioresources especially for the development of new products and processes.
2. To develop a scientific plan of action for contributing to the economic prosperity of the nation through accelerated research & development using the modern tools of biosciences. The scientific programmes to be undertaken under the guidance of the Board would be inter-disciplinary, inter-institutional, and time bound with clear-cut milestones. Some illustrative areas include :
 - To evolve effective ex situ conservation strategies for bioresources of potential scientific and economic value,
 - To develop predictive groupings of biological resources through well-established molecular lineages,

- To construct gene maps of bioresources that can be used for locating useful genes,
- To promote the use of biological software in the management of agricultural pests and pathogens,
- To promote value addition to bioresources,
- To train human resource for the achievement of above objectives,
- To strengthen bioinformatics vis-à-vis bioresources

A National **Steering Committee** has been constituted to support the activities of the Board under the Chairmanship of Professor A. K. Sharma, University of Calcutta.

Priorities

The first meeting of the Board held in January 2000 under the chairmanship of the Hon'ble Minister of Science and Technology identified two priorities: (a) preparation of digitized inventories of plant, animal, microbial, and marine resources, and (b) R&D projects, programme support, establishment of Centres of excellence, training activities and demonstrations, for the development of bioresources for special areas such as north-eastern region, Himalayan region, coastal & island ecosystems, desert region, Indo-Gangetic plain and Peninsular India. Additionally, knowledge empowerment and human resource training would be a priority area for the Board.

Status Of Activities

Two meetings of the Board, four meetings of the Steering Committee and over twenty meetings of Expert Groups have been held under the NBDB.

Work on digitized inventories of medicinal plant resources, economically important species other than medicinal plants and marine resources has already commenced. Projects on "Integrated programme on conservation, inventorisation and enhancement of coastal bioresources" and "Establishment of biotechnology park for capacity building and economic upliftment with particular reference to women of the Indian Himalayan region" have been sanctioned. Three projects entitled "Development of Database on Microbial Resources of HP", "Domestication, Characterization Conservation and sustainable Utilization of Endangered Medicinal Plant Species of HP" and "Development of Database on Plant Resources in the State of Himachal Pradesh" have also been funded. Similarly, special programmes for the north-eastern region have been formulated. Institute of Bioresources and Sustainable Development at Imphal has been established. The Institute would concentrate on the development of the bioresources and their sustainable use through biotechnological interventions for the socio-economic growth of the region. Training, research, demonstration and technology development would be the focus of the Institute.

E. TRADITIONAL KNOWLEDGE DIGITAL LIBRARY

Recently the Government of Indian has commenced effects to set up, what is being called on a – “Traditional Knowledge Digital Library (TKDC). While not much is known about this effort some information have been made available in the National Institute of Science Communication (NISC) of CSIR (Gupta, V.K., 2001). The principal objective of the TKDL Project is to prevent misappropriation of our Traditional Knowledge available in the public domain from being patented and render the TKDL in a format that could be examined by patent examiners globally before granting patents based on Indian Systems of Medicine. In order to enable this the TKDL is simultaneously being translated into English, Hindi, German, French, Japanese and Spanish languages. This is a collaborative project the Dept. of ISM&H, between CSIR (NISC).

For bringing out a TKDL on ayurveda, a Memorandum of Understanding was signed on 6 June 2001 between the National Institute of Science Communication (NISCOM), New Delhi and the Department of Indian Systems of Medicine and Homeopathy (ISM&H), Ministry of Health and Family Welfare. It had been suggested that – “when compiled, TKDL would have documented the traditional knowledge available in the public domain in a digitized format”. Starting with the existing literature in ayurveda, it would later cover unani, siddha, naturopathy, homeopathy and folklore medicine. In the first phase, a ‘Traditional Knowledge Resource Classification (TKRC)’ is being prepared for 2147 medicinal plants. The content of TKDL would initially consist of about 35,000 verses from ayurveda. These slokas gleaned from 14 ancient texts and recognized books would be digitally transcribed into a readable form, and made available both in Indian and foreign languages. TKDL would help patent examiners the world over to have a ready reference to Indian traditional knowledge, while granting patents in such domains.

TKDL is an effort that brings together the Department of ISM&H, CSIR and the Ministry of Commerce and Industry.

Methodology used for TKDL

Slokas from ayurvedic texts are first identified. Each sloka is read and converted into structured language using Traditional Knowledge Resource Classification (TKRC). TKRC is innovative in itself. The TKRC classification has been evolved for about 5000 sub groups as against one group in the International Patent Classification (IPC) for traditional knowledge. The TKDL portal would be based on XML standards and would be platform-independent. The codes for each sloka are fed into a data entry screen and also saved on the database. Ayurveda experts carry out the data entry. These are then decoded in different languages. The ayurvedic formulations can be presently decoded in English, French, German, Hindi, Japanese and Spanish. In future, it would be available in 20 foreign languages and all Indian languages. The decoded format of the formulation is easy to read and understand, even by the layman. The web version of TKDL would include a web-based search interface. This would provide for a full text search and retrieval of traditional knowledge information on IPC and keywords in multiple languages. TKRC would be an integral part of TKDL and would provide a background on ayurvedic concepts, definitions and scientific basis of Indian systems of medicine. In addition, it would carry information on practitioners, hospitals and dispensaries. There are several search features incorporated in the format.

The TKDL initiative is a good start although it is incomplete in its scope. It does NOT for instance protect the vast non-codified knowledge of plants. It is also not designed to address the issue related to disputes about the novelty of modification and the larger issues of cultural domination of the IPR system by European culture.

F. NATIONAL MEDICINAL PLANTS BOARD

The National Medicinal Plants Board, that has been constituted recently appears to have as its thrust the target of producing medicinal plants and herbal material for exports. As per press reports, Dr. D. N. Tewari, Member, Planning Commission, Government of India, had stated – "...an ambitious plan to commercially exploit herbal wealth in order to cut India's fiscal deficit, is being pro-actively pursued by the Planning Commission". It has also said that the Medicinal Plants Board was being created – "on the lines of Tea and Coffee boards, to trade directly with various countries". (Anonymous, 2000)

III. PRECAUTIONS IN RECORDING TRADITIONAL KNOWLEDGE

A. THE TURMERIC CASE

On 28th December 1993, an application for a patent on the 'use of turmeric in wound healing' was filed before the United States Patent and Trademark Office. Suman K Das and Hari Har P. Cohly were shown as the inventors, and the University of Mississippi Medical Centre was shown as the assignee. The patent was granted by the United States Patent and Trademark Office on 28 March 1995 under Patent No.5,401,504. The main claim in the patent was: 'A method of promoting healing of a wound in a patient, which

consists essentially of administering a wound-healing agent consisting of an effective amount of turmeric powder to the said patient. This patent was challenged by the Council of Scientific and Industrial Research, India, which applied to the United States Patent and Trademark Office for re-examination of the patent. The basic thrust of the Indian challenge was that turmeric is known to be beneficial for wound healing. It has been used for such purposes in India over centuries, and that the inventors have added nothing new to this knowledge. India claimed that the patent did not fulfil the legal requirement of novelty. India was able to show, by means of 32 documents, that the claimed new use for turmeric had in fact been well-known in India long before the filing of the patent application. This challenge succeeded and the patent was revoked. It was thus overturned, as there had been nothing new done by the inventors, i.e., they had not in fact invented anything, and so could not be granted a patent. The experience gained in the turmeric case has highlighted the advantages inherent in the recording of traditional knowledge. In order to understand the effect that this will have on future patents, it is necessary to analyse it in the context of the legal framework. (Udgaonkar, Sangeetha./ Current Science. 2002)

B. UTILITY OF RECORDING TRADITIONAL KNOWLEDGE

By recording the traditional knowledge, legally, it becomes public domain knowledge. Under the patent law, this means that it is considered to be prior art and hence is not patentable. Such a written record, in a form easily accessible to patent offices around the world, would provide all such offices with a record of India's prior art. Patent examiners could easily check this database and reject any patent application that might be a mere copy of traditional knowledge. Being in document form, it would be acceptable to patent offices that insist on a written record of prior art, as in the United States. To this extent it would prevent cases of 'bio-piracy'. However, it has also been pointed out that we need a system that combines easy access to traditional knowledge with payment for the use of that knowledge. It is said that contract law is best suited for this purpose. A mechanism has been suggested for this. (Udgaonkar, Sangeetha). We quote from an interesting paper (Udgaonkar, Sangeetha 2002).

“The recording of traditional knowledge is taking place today. It is imperative that the method of recompense be in place before the information being recorded is made public. Failure to do this would be doing a grave injustice to those who developed this knowledge through generations. Traditional knowledge is in demand as a source of information of the possible properties of biological material. It is valuable knowledge. We should place its value high, not devalue it completely by giving it away free. Unless we do so, no one else will acknowledge that it has any value at all. Intellectual property rights including patent rights are rights over knowledge. We have that knowledge. Let us not give up our rights. In dealing with patents we are dealing with a law designed for businessmen. Let us also have a business-like approach to the problem. By designing the structure of the traditional knowledge database appropriately, it is possible to make the knowledge available to all and at the same time retain the control necessary for benefit sharing to be

operationalised. This would go far in ensuring that cases of ‘bio-piracy’ are prevented in the future.”

C. TRADITIONAL KNOWLEDGE AND BENEFIT SHARING

It is interesting that in India we already have a recorded instance where perhaps for the first time Tribals have been rewarded for their knowledge.

TOWARDS BENEFIT SHARING: THE KANI – TBGRI ARRANGEMENT

A much publicised case of benefit sharing is the development of a drug based on the plant Arogyapaccha known to the Kani tribals of Kerala. Study of the leaves of the plant revealed it had anti-stress, anti-hepatotoxic and immunodulatory / immunorestorative properties. Eventually, the drug Jeevani was formulated by Tropical Botanical Garden and Research Institute (TBGRI) with Aarogyapaccha and three other medicinal plants as ingredients. Thereafter, a license to manufacture Jeevani was given to Arya Vaidya Pharmacy, Coimbatore (AVP) in 1995, for a period of seven years, for a fee of Rs.10 lakhs. TBGRI decided that the Kani tribals would receive fifty percent of the licence fee, as well as 50 percent of the royalty obtained by TBGRI on sale of the drug. In November 1997, some of the Kanis, with assistance from TBGRI, registered a trust called Kerala Kani Samudaya Kshema Trust with the objectives of: welfare and development activities for Kanis in Kerala, preparation of a biodiversity register to document the knowledge base of the Kanis, and evolving and supporting methods to promote sustainable use and conservation of biological resources. Although all the Kanis of Thiruvananthapuram district are yet to become members of the Trust, efforts are on to achieve the same. Fifty per cent of the licence fee received by TBGRI has been transferred to the Trust. However, manufacture of Jeevani, and therefore flow of royalties, has run into problems for a number of reasons. The Kanis mostly live in and around the Reserved Forest areas of Thiruvananthapuram district. They would, therefore, require the permission of the Forest Department (FD) for harvesting the plant, which has not been forthcoming because of fears that commercial harvesting would threaten conservation of the plant. This has also been compounded by incidents of pilferage of the plant by non-tribals. There is also no uniform view among the Kanis, some of whom have objected to the manner in which the “arrangement” with TBGRI evolved.(Anuradha R.V. 2001).

CHAPTER – V

RECOMMENDATIONS

Ideally we would have liked the present the recommendations in the logical sequence of Gap Analysis – Strategies – Required Actions. However we felt that it is more important that we should present as a coherent whole, views from certain stakeholders whose voices are never ever heard usually in the planning process (eg.) Folk healers, raw drug collectors and the households. We have make special efforts to get inputs from these sections and we felt that something of the coherence of their recommendations would be lost if we it disperse it over various different subsections. Hence we have grouped the recommendations under the following headings

- A. Nutrition and Biodiversity.
- B. Folk traditions
- C. Bioresources for Health : Plants and Animals
- D. Voices from the ground
- E. Policy on ISM and some other issues.

However we recognise that for practical convenience in terms of action plans and implementable programs it is valuable to classify recommendations or cross reference them based on their government department or agency which it pertains to. We are carrying out such an exercise independently, to be circulated at the Final National Workshop of NBSAP.

D. NUTRITION AND BIODIVERSITY

1. Two types of diversification would help national as well as household food and nutrition security.
 - Diversification within food grains, i.e. millets and legumes besides cereals
 - Diversification between food grains, horticulture (fruits and vegetables) and livestock products.
2. Studies that examine / illustrate or have a lesson in terms of the links between Health and Biodiversity are very few. They need be analysed in detail and lessons from them incorporated into the plans. Also, more such studies need to be planned.

ACTION SUGGESTED

1. Formulate agriculture policy/programmes based on the local food pattern and ensure production of traditional food crops along with new hybrid crops and cash crops.

2. Ensure availability of traditional food crops, particularly those, which are known to be rich in nutrition in local markets, Public distribution systems, Anganwadi, mid-day meal programs and hospitals.
3. In the case of subsistence dependent committees (i.e. those which are highly dependent on the natural resources base for survival), the Government should –
 - Maintain their traditional access to water and forests. Only they can we ensure their health. This is particularly important during time of crisis or stress (eg.) drought period.
 - The continued propagation and strengthening of the traditional knowledge of these communities for the use of bioresources must alike facilitated and encouraged.

E. FOLK TRADITIONS

1. NEED FOR INFORMATION

There are no estimates at a National or state level about folk medicinal traditions, in terms of their numbers, distribution, specialisations, transmission of knowledge etc. It is suggested that some baseline statistics on them can be obtained in the following ways –

- a. Compilation and analysis of detailed information available with NGOs or academics who have detailed knowledge about folk traditions in small areas or about specific communities / tribes.
- b. NGOs such as ADS, LSPSS and FRLHT have rich experience about the current status of folk traditions in various parts of the country. An effort needs to be made to collect and synthesise their inputs since currently they are the most knowledgeable about folk traditions.
- c. Making these estimates part of an exercise such as the National Sample Survey (NSS).
- d. Working towards a special study of Folk Health Traditions as part of the 2011 census operation.

2. ALL INDIA COORDINATED RESEARCH PROJECT ON ETHNOBIOLOGY

The All India Coordinated Research Project on Ethnobiology (AICRPE) is an eye opener in terms of the great richness and diversity of folk medical knowledge. Some steps needed in this connection are –

- a. The results of the studies need to be made public. First and foremost all the people who gave the information need to be the recipients of the synthesised results.
- b. One of the proclaimed aims of the AICRPE is – “.... development of location oriented production technology for the upliftment of the tribal communities.” This need to be given importance and followed up.
- c. The mid-term report notes that – “.... the tribals who still live in undisturbed forest areas and having the traditional food habits (eating a large variety of seasonal foods that they get from the forests) are found to be healthy and free from most diseases. However, most of the tribals today are deprived of the traditional food choice due to depletion of forest resources and destruction of forest areas. These tribals are malnourished and are susceptible to many diseases”. This suggests that a very essential step is continued access of tribals to their traditional resource base.

3. PERCEPTIONS OF NATTU VAIDYAS

In the perception of the Nattu vaidyas themselves, some of the important recommendations emerged. The following were some of the suggestions received in terms of action that can be taken –

- (a) Among the problems faced by the Nattu Vaidyas the following found prominent place – lack of recognition and honour in society, lack of any help from the Government, problems in obtaining information regarding herbs as well access to herbs. Efforts can be initiated by the State and Central Government as well as private bodies to recognize and publicly honour outstanding Nattu Vaidyas who are carriers of the traditions.
- (b) Effort should be made to encourage and support the cultivation of difficult to obtain species, and the cultivation of species identified as being suitable for cultivation in home gardens.
- (c) In terms of sustainable harvesting and conservation some of the suggestions made were – not collecting more than what is required, planting species whenever one harvests plants, creation of awareness among people regarding importance of medicinal plants, protecting herbs in protection centres, ban on exports and ban on grazing by goats in specified areas.
- (d) Prohibition of slaughter of cows for meat, steps to increase availability of natural fertilizers and green manures, steps to protect forests against destruction, protection of herbs by NGOs and curbs on hunting of animals and birds.
- (e) Transition from traditional pattern of crops to new crops can lead to loss of biological diversity and make bioresources necessary for health less available or unavailable. For example, in the traditional pattern of crops

there were a number of insect species including crabs and snails that are found in the fields, which are now disappearing. Some regulation needs to be put in place to check such a trend.

- (f) It appears that currently the contracts for the harvesting and collection of NTFP (Non-Timber Forest Produce) is largely given by the Forest Department to contractors. It was suggested that contracts to collect NTFP should be given to local Communities including NGOs, Vaidyar Sangams.
- (g) The forest department should also take up experimental studies and make detailed observations on regeneration of various plant species so that we may gather information regarding sustainable harvesting practices.
- (h) Efforts should be made towards the introduction of a certification procedure for all products that make use of natural products and bio-degradable products with the mark – “Bio-friendly” since this would provide a boost to such efforts.
- (i) Create mechanisms for marketing of medicinal plants and regulatory bodies to regulate its functioning. Panchayats can be one such body at the village level.
- (j) Create bodies for organization, regulation, upgradation and promotion of local healers.
- (k) Educate communities, health workers, and supervisors, program planners and educators on the traditional foods and concepts of diet - time, seasonality and festivals, role and importance of herbs in primary health care, importance of environment, impact of environment degradation on peoples health and the means for its conservation.
- (l) Set up small-scale pharmacies at district /village level to be managed by Panchayat and local women's groups.
- (m) Develop and disseminate updated information on traditional healing in local language. Initiate healer's newsletter and encourage networking.

4. PERCEPTIONS OF WOMEN

Recently, there have been specific attempts to document and test the use of medicinal plants and bioresources with specific focus on women’s problems. An interesting beginning has been made in this matter by the compilation produced by SHODHINI network that has been referred to earlier. Such attempts can be encouraged and multiplied to serve as a valuable input to how Biodiversikty conservation can take note of the perception of women and also pay specific attention to women’s problems.

F. BIORESOURCES FOR HEALTH CARE : PLANTS AND ANIMALS

Health care is crucially dependent on plant and animal resources. In this section we provide an overview of the action required for the conservation, cultivation and trade in these resources.

1. MEDICINAL PLANTS

Organized efforts by the Botanical Survey of India (BSI) since its inception in 1890 (reorganized in 1957) have resulted in botanical exploration and inventorying of about 60% of the geographical extent of our country, whereas faunistic surveys undertaken under the aegis of the Zoological survey of India (ZSI) (founded in 1916) have so far covered about 35% of India's geographical area. This indicates that a sizeable area, covering several unique wilderness sites, both in our protected and non-protected systems, 'hot spots' the unknown and unexplored canopies of tropical rain forests, wetlands, coral reefs, etc. still remains under – or unexplored. Some of the major challenges of systematic biology research in India are –

- Completing the unfinished task of inventorying floristic, faunistic and microbial diversity in the under or unexplored regions.
- Execution of flora of India and fauna of India work within a definite time frame, and
- Making detailed assessments of threat status of all medicinal plants.

As per the analysis of the comprehensive database on medicinal plants available with FRLHT, 90% of the medicinal plants occur in land officially designated as "Forests". However if the analysis is taken up with an ecological rather than a legal definition of 'Forests' then it is seen that 70% of medicinal plants occur in forest habitats and 30% in other landscape elements. Forest conservation plans must include conservation of wild population of plants and animals and not focus only on Minor Forest Produce (MFP) and Non-Timber Forest Produce (NTFP). It may be noted that the total number of species recorded as medicinal plants are of the order of 8000 while the species identified as MFP and NTFP are only of the order of 250 species.

G. CONSERVATION

In situ conservation strategies

In the context of medicinal plants the most effective way of undertaking conservation of inter and intra-specific diversity is by creating a network of in situ forest reserves across different forest habitats that may exist in a country. The size of the forest reserves in tropical forests could be 200 to 500 hectares size each. In the high altitude forests, it could be around 50 hectares. A network of such forest reserves will act as "in situ gene banks" of the medicinal plants of the country. This is a novel concept and the fastest method for conservation of the germ plasm of the medicinal plants of the country. These in situ gene banks can provide breeders and growers access to the wild genetic resources

for cultivation programmes. Establishment of in situ gene banks is also the most cost-effective way to conserve and maintain the germ-plasm of medicinal plants of a State. It is far cheaper than cryo-preservation of any other ex-situ approach. The in situ gene banks need to be located in relatively undisturbed forest reserves. They should preferably be sited in a natural micro watersheds. Each gene bank should be located in different forest types and across the altitudinal range existing in the State so that across a network of 10-15 gene banks, one can capture the entire range of inter-specific diversity of the medicinal plants of the State.

Currently 30 MPCAS are in existence in the states of Tamilnadu, Kerala and Karnataka and it is stated that 18 more MPCAS will be set up in Andhra Pradesh and Maharashtra under a UNDP programme. This needs to be increased to so that we have at least one MPCA in each district of the country. It is estimated that there are 50 ethno-medicinal plant gardens in various parts of the country. This number needs to be increased significantly, ideally to at least on garden per district. Conservation efforts can be built around existing traditional institutions such as Sacred Groves that are nurtured by communities in various parts of the country.

Ex situ conservation programmes

Today, given the growing commercial demands on the plants & the shrinking of forests, there is no option but to urgently cultivate medicinal plants. Policy intervention is, therefore, urgently needed to encourage and facilitate investments into commercial cultivation of medicinal plants. It can be presumed that cultivated plants are likely to be somewhat different in their properties from those gathered from their natural habitats. Such differences can also be observed in the chemical expression of plants at different times of the same day, and in different seasons, at different stages of the plants growth and it is suggested in traditional literature, even under different constellations. One does not, however, have a measure of the significance of the differences. On the other hand scientists affirm that certain values in plants can be deliberately enhanced under controlled conditions of cultivation. As a general policy, therefore, 'Polyculture' models for cultivation of medicinal plants where the species mix is based on natural associations, may be preferable to mono-culture cultivation. It is also advised to grow plants organically in their native agro-climatic locations and in habitats where they are naturally distributed.

B. CURRENT STATUS OF CULTIVATION

The scale of cultivation of medicinal plants in the country today is very small. It is estimated that all over India, there are around 20,000 hectares under cultivation of medicinal plants. The extent of cultivation is inversely linked to prevalence of easy and cheap collection from the wild, lack of regulation in trade, cornering of the profits from wild collection by a vast network of traders and middlemen and absence of schemes of industry for providing buy-back guarantees to growers. Cultivation of medicinal plants is also difficult due to lack of standardised agronomic practices for most species and unavailability of sources of quality planting materials. Policy measures to promote cultivation of medicinal plants therefore need to facilitate industry's role by way of providing incentives to industries for sourcing of their raw material from cultivation and for their investments in

agricultural research. There is simultaneously also a need to regulate indiscriminate and destructive collection of medicinal plants from the wild, particularly for endangered species. In the context of medicinal plants, there is a special case for encouraging organic systems & polyculture models instead of the conventional mono-culture models currently prevalent in agriculture and agro-forestry. Given India's large population and food security needs, it is not wise to shift agricultural lands committed to food crops to growing medicinal plants. There is, therefore, a special case for encouraging in an organised way, (on the *AMUL* milk model) an "area" approach wherein in a contiguous area, thousands of small, marginal farmers and tribals can be encouraged to grow medicinal plants in their household gardens, bunds and wastelands rather than promoting big farmers, and large plantations strategy. This kind of "area" and 'small farmer approach' can encourage economic participation of the rural poor, in the growth of the herbal industry.

Bottlenecks (agro-technology & economics, size of market)

The bottlenecks for cultivation are firstly that the size of the market for cultivated plants is relatively small. This is because most of the raw materials are sourced from the wild and the cost of wild collection is cheaper than that of cultivated sources. If the forest managers raise the price of wild plants so that it becomes equal or more than the cost of cultivation, then there will be an incentive to the farmers to cultivate. Today the farmers do not undertake cultivation because lack of remunerative prices and buy-back guarantee. Another bottleneck of cultivation is that there is very little data on the economics of cultivation and the agronomic practices involved in cultivation under different edaphic and climatic conditions. Agricultural Universities have worked on very limited species.

C. QUALITY CONTROL SCENARIO WITH RESPECT TO MEDICINAL PLANTS (POST-HARVESTING TECHNOLOGY AND QUALITY STANDARDS)

One more important area for focussed research is on the pharmacognosy of plants. With respect to plants used in indigenous systems of medicine, their therapeutically "active compounds" cannot be inferred from traditional medical texts, nor has there been any clinical studies to correlate concentration of specific active compounds to the enhanced efficacy of the plants. The traditional advice relating to potency of plants relates to their collection, in particular, seasons and from preferred habitats (*Desh Vichar*) and also to their specific biological activity expressed in terms of parameters like *Rasa*, *Veerya*, *Guna*, *Karma*, etc. We need to, therefore, urgently develop creative pharmacognostic methods based on traditional knowledge. The current official standards are only related to the botany and chemistry of plants, but ignore their biological activity.

Domestication of wild medicinal plants and animals is also a priority and one needs to encourage cultivation and captive breeding. Research is needed on poly-culture cultivation models and on selection of clinically efficacious varieties of medicinal plants and animals, their wild habitats, collection seasons, the stage of growth for their harvesting and nursery techniques, seed storage and their organic farming (with respect to plants).

There is need for technology interventions related to post-harvesting viz., drying and storage of medicinal plants. Help needs to be given for processing by communities at village level, to obtain better returns. Also, support is needed for quality control, marketing, labelling.

D. TRADE

- a. Regulation of harvest in the wild.
- b. Corrections needed in the supply side are – (i) well laid out inventory of medicinal herb occurring in the wild; (ii) statistics of their incremental aspects for ensuring that only the periodic increments are removed scientifically; (iii) rejuvenation of the degraded forests with the regeneration of medicinal plants; (iv) cultivation of endangered and extinct species in forest nurseries and on degraded common properties (CPs). The provision of the Forest Conservation Act, 1988 prohibits the plantation of medicinal plants on forestlands without the prior permission from the government of India. Such provisions need corrections under the present context.
- c. There are some successful intervention in terms of sale. For example it appears that in Kerala procurement of NTFP through Tribal Cooperative Societies (TCSs) have liberated the tribals from the clutches of private traders. Similarly in Gujrat the GSFDC appoints collection agents who collect NTFPs from tribal people a price fixed by a state level committee which has representation from tribal people as well as the business community. This has helped the poor to be gainfully employed through the non-agricultural season.

E. COMMUNITY BASED INITIATIVES

There are some promising community based initiatives that can serve the twin objectives of conservation and delivery of health care. One such initiative is the Kitchen Health Garden (KHG) initiative.

- The KHG programme can be a very important method to combine biodiversity with Health and Nutrition involving the committee in a big way. The recommendation about the programme can be summarised as –
- Increase populations that have knowledge about home remedies. Create awareness that home remedies are the first line of action for ill health. Only if there is no alleviation of symptoms, after four / five days should an outside physician be consulted
- Focus on a few common complaints initially. Target the program on common complaints affecting women and children. Clinical trials can validate simple medicinal plant based treatments, for common complaints.

This can then be standardised and sold as packets in tea shops (like in the case of the Oral Rehydration therapy).

- Use concepts from social marketing for designing further expansion.
- Bring in nutritional plants in the medicinal plant packages.
- Allopathic physicians require pharmaceutical and pharmacognosy training on medicinal plants. The Government should come with regulations for incorporating these in regular medical training.
- A Supreme Court order prohibits doctors from prescribing drugs from other systems. Although several doctors are convinced about the efficacy of traditional medicine, legally they cannot prescribe. Some sort of advocacy is required to change this.
- Women's groups / Self help groups with focus on women may be encouraged to continue exploration of the use of remedies specifically for women's problems and also for the assessment of the value and utility of biodiversity at the local levels from a women's perspective.

2. ANIMAL PRODUCTS

In the context of the use of animal products in tradition medicine, studies need to be undertaken in the following areas –

- Use of animal products by folk practitioners other than tribals
- Survey of animal products mentioned in various ISM texts. For example, products mentioned in the pharmacopoeia covers only a small part of ISM preparations currently in use.
- The sustainable use and harvest of many of these animals requires a detailed investigation and studies in the present day context. Traditional medicine practitioners have reported, for example, that their practice has been adversely affected and limited due to lack of availability / shortfall of animal products such as musk.

D. VOICES FROM THE GROUND

We had undertaken a sample survey of households, rawdrug dealers and folk practitioners in three districts (each) of Gujarat and Rajasthan. Suggestions based on this survey are summarised below.

TABLE 18. MEASURES FOR IMPROVING THE SITUATION (GUJRAT)

Community	Market	Panchayat	Government	NGOs	Others
Cultivate more trees in fields and waste Lands	Regulation of price of herbs	Trees/Plants should be cultivated	Give funds for cultivation of herbs	Create awareness on use of herbs in communities	Foreign funds should be used for herbal cultivation and production
Use more herbs	Herbs sold at affordable price	Stop felling of trees	Provide technical input in herbs cultivation, storage and production		Develop a market and fix price of herbs
<i>Protect herbs</i>		Fix the price of herbs and raw materials			

TABLE 19. MEASURES TO CONSERVE BIODIVERSITY (RAJASTHAN)

Self	Organization	Panchayat	Women's Group	Others
<ul style="list-style-type: none"> -Cultivate and protect medicinal plants -Prohibition on cutting trees -Growing more trees -Promotion for cultivation and protection of trees 	<ul style="list-style-type: none"> -Create awareness among people on how to use and maintain herbs -Provide support to the communities for protection and protection of medicinal plants -Formation of pressure groups -Propaganda to save forest and tree gardens 	<ul style="list-style-type: none"> -Prohibition on cutting trees -Law to stop cutting of trees -Protection and cultivation of trees -Make gardens with the involvement of villagers -Involving school children and elders to cultivate and 	<ul style="list-style-type: none"> -Awareness among women and children on advantages of medicinal plants and its protection 	<ul style="list-style-type: none"> -Campaign on 'save the trees' -Decrease population -Provide support to the organizations for protection and cultivation of trees/forest -Emphasize herbs plantation on waste land of the

		protect tress		villages -Formation and selection of committee to protect herbs
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E. ISM POLICY

The following is a summary of key recommendations about the ISM Policy of the Government.

1. ISM should explicitly recognise the existence of and support the strengthening and revitalisation of tribal / folk traditions besides the classical traditions.
2. The Government role should be that of a facilitator rather than the sole actor and non-government agencies must also be involved in the planning and implementation of all aspect of ISM.
3. There must be emphasis on the use of ISM epistemology in research, drug development and standardisation.
4. Some of the key recommendations pertaining to medicinal plants are –
 - a. Cultivation is practiced today only for less than 20 species where the demand exceeds supplies from the wild. It is necessary to offer remunerative prices for cultivated herbs and to make the price of produce collected from the wild at such a level that cultivation is desirable.
 - b. Conservation must be based on a network of forest based in-situ gene banks paying attention to inter and intra specific diversity of medicinal plants.
 - c. The scope of the National Medicinal Plants Board needs to be enlarged so that it serves the need of not only the pharmaceutical industry but also the non-commercial users (folk practitioners, households etc.)
 - d. The recommendation of the planning commission Task Force on preservation, promotion and cultivation of medicinal plants are also oriented largely to the big corporates. Involvement of local communities, traditional healers etc in these activities has been ignored.

5. The recommendations that have been put forth by the Women and Health Initiative (WAH) represent a broad based effort to produce a critique of the national health policy and ISM policy from the point of view of the women's perspective and their needs. Particular attention may be paid to specific recommendations of this group which have been cited earlier.

IPR AND TRADITIONAL KNOWLEDGE

In the context of various efforts to document traditional knowledge it is important that the method to recompense be in place before, the information being recorded is made public. It has been stated by experts that – “By designing the structure of the traditional knowledge database appropriately, it is possible to make the knowledge available to all and at the same time retain the control necessary for benefit sharing to be operationalised”.

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APPENDIX : I**LIST OF MEMBERS OF THE THEMATIC WORKING
GROUP ON HEALTH AND BIODIVERSITY**

Sl. No.	NAME AND ADDRESS	REMARKS
1.	Mr. A.V.Balasubramanian Centre for Indian Knowledge Systems, No.30 (Old No.47-C) Gandhi Mandapam Road, Kotturpuram, Chennai 600 085.	Coordinator
2.	Dr.Veena Shatrughna Deputy Director, National Institute for Nutrition, Jamai-Osmania P.O. Hyderabad 500 007.	Nutrition Scientist
3.	Dr.Renu Khanna, 1, Tejas Apartments, 53 Hari Bhakti Colony, Old Padara Road, Vadodara 390 015	Women's health Activist
4.	Vaidya R.M.Nanal C-1, Morning Star, Near Saraswati Mandir High School, Sitaldevi Temple Road, Mahim, Mumbai 400 016.	Ayurvedic Physician
5.	Vaidya Manju Ahal, 'Kutumb', Tika Ayama, Palampur, Dist. Kangra, Himachal Pradesh 171 061.	Ayurvedic Physician
6.	Hakim Syed Khaleefathullah, 49, Bharathi Salai, Triplicane, Chennai 600 005	Unani Physician
7.	Dr. H.Sudarshan Vivekananda Girijana Kalyana Kendra, B.R.Hills, Yelandur Taluk, Chamrajnagar District Karnataka 571 441.	Allopathic Physician
8.	Dr.Mrs.Lakshmi Raghupathy, Joint Director,	Representing the MoEF

	Ministry of Environment and Forests, Paryavaran Bhavan CGO Complex, lodhi Road New Delhi 110 003	
9.	Dr.V.Subramanian Joint Director Directorate of Indian Systems of Medicine, Anna Hospital Campus, Arumbakkam, Chennai 600 106	Siddha Physician, represents the Government of Tamil Nadu. Currently, he has retired from Government service
10.	Department of ISM, Ministry of Health and Family Welfare, New Delhi.	No permanent member but, they had agreed that a representative may be present to attend the meetings of the working group as and when they take place.
11.	Mr.Darshan Shankar, Executive Director, Foundation for Revitalisation of Local Health Traditions, 50, 2nd Stage, 3rd Main, M.S.H. Layout, Anand Nagar, Bangalore 560 024	Member of TPCG of NBSAP

APPENDIX II

A BRIEF DESCRIPTION OF THE NBSAP PROCESS

CHRONOLOGY OF NBSAP EFFORTS

YEAR 2000

- September 25th meeting with Dr. Lakshmi Raghupathy, Ministry of Environment at New Delhi
- September 26th meeting with Dr. Kishore Banguri, Director, Centre for Law and Environment, World Wild Life Fund, New Delhi
- October 20th - 21st NBSAP meeting in New Delhi
- November 1st meeting with Dr. Lakshmi Raghupathy, Ministry of Environment at New Delhi
- November 10th Mr. Ajay Rastoji of the Eastern Himalaya Programme of ATREE and Ms. Ruchi Pant, Director ATREE, Darjeeling visited us. They could give information about groups and contacts in the North East.
- November 14th meeting with Dr. V.Subramaniam, Joint Director, Siddha Directorate of Indian Systems of Medicine, Government of Tamil Nadu at Chennai.
- November 24th Ms. Jayshree Venkatesan of "Earth Care" visited CIKS in connection with coordinating the work of preparing the National Biodiversity Strategy and Action Plan.
- November 28th - 29th meeting with Dr. Vineetha Sharma, Department of Science and Tehcnology, Division of Science and Society for Women New Delhi in Kerala.
- December 2nd Dr. R.K.Agarwal, Natural Remedies, Bangalore, Office bearers for ADMA (Ayurvedic Drug Manufacturers Associations of India) at Chennai.
- December 11th Discussion with CHETNA, Ahemdabad with Ms. Indu Capoor at Ahmedabad.

YEAR 2001

- January 11th Dr. Patrick Gomez, Professor and Head of Department of Botany, St. Joseph College, Trichy visited us and invited us to participate in the National Symposium on Medicinal Plants to be held in Trichy in February 2001.

- January 11th meeting with Dr. Muraleedharan, Principal and Dr. Shyam Sundar, Faculty Member, Sri Jayendra Saraswathi College, Nazarathpet, Chennai.
- January 22nd FRLHT meeting on Kitchen Herbal Garden Programme, Chennai.
- January 24th meeting with Mr. Krishna of IRULA Tribal Welfare society, Chennai.
- February 9th Sri Gopi Warriar of Business Line visited us to Interview about the National Biodiversity Strategy Action Plan.
- February 19/20th meeting with Officer bearers of National Museum of Natural History, Bhopal
- April 12th meeting with Dr. Sagari Ramdass and staff of ANTHRA, Hyderabad.
- April 14th – Dr. Amit, Natural Remedies, Bangalore.
- May 8th at the invitation of Prof. Nirmal Sengupta of Madras Institute of Development Studies (MIDS), A.V. Balasubramanian and K. Vijayalakshmi participated in the meeting that was held for planning a series of workshops on protection and development of traditional knowledge. Suggestions were made about various areas that could be taken up for discussion and resource persons and panelists were identified.
- June 6th Addressed Inaugural session of the meeting of the working group of aquatic bio-diversity.
- June 13th – 14th A.V. Balasubramanian attended the mid-term review meeting of the National Biodiversity Strategy and Action Plan.
- August 29th – meeting at Tamil Nadu Forest Department, Chennai
- December 27th - 29th A.V. Balasubramanian took part in a three day festival of Indian Medical Heritage (Mooligai Utsavam) at Madurai which was organised by FRLHT and also cosponsored by the NBSAP. A.V. Balasubramanian made a presentation in a session devoted to discussion on the National Biodiversity Strategy and Action Plan.

YEAR 2002

- January 17th, A.V. Balasubramanian delivered a lecture on – “Building on indigenous health traditions” to a group of students attending a course on – “Technology and sustain-able development” at I.I.T. Chennai.
- March 25th, 26th a workshop on – “Traditional knowledge appreciation for policy making” was held at New Delhi organised by Professor Nirmal Sengupta of the Madras Institute of Development Studies. A.V. Balasubramanian participated in

the workshop and made a presentation on traditional knowledge regarding indigenous systems of health.

NBSAP DRAFT DOCUMENTS

- January 11th, 2002 – First draft sent to NBSAP office
- February 13th, 2002 – Second draft sent to NBSAP office
- October 2002 – Third draft for wider circulation.
- December 2002 – Fourth draft after receiving comments

APPENDIX III

LIST OF PEOPLE WHO HAVE CONTRIBUTED TO THIS PROCESS

A large number of individuals and institutions have generously contributed time and effort in the process of compiling this report. We are grateful to the following who have helped us in various ways in this effort.

- Mr Ashish Kothari of Kalpavriksh for his constant efforts to supply information, the great patience with which he read through the manuscripts in detail and the promptness with which he responded to various queries.
- Mr. Darshan Shankar, member of the technical policy core group for his detailed comments and suggestions and sharing of a large amount of information as well as constant guidance and encouragement.
- All members of the thematic work group of Health and Biodiversity (a list is given in Appendix I)
- The Foundation for Revitalisation of Local Health Traditions, Bangalore – Mr. Hariramamoorthy for his help during the Mooligai Utsavam at Madurai, Mr. G. Raju for sharing material regarding the KHG programme, Mr. Utkarsh Ghate for information and inputs, Siddha physician, Dr. Rajalakshmi for information regarding animal products used in Siddha medicine and the TSM unit for sharing reprints and information.
- The field survey in Gujarat and Rajasthan was coordinated by Vaidya Smita Bajpai Chetna, Ahmedabad under the guidance of Ms. Indu Capoor and Ms. Pallavi Patel.
- The survey in Rajasthan was carried out with the collaboration of Ms. Sanju Devi, Mr. Mohan and Mr. Ramjilal Taylor of Gram Vikas Navyuvak Mandal, Lapodiya, Mr. Rajan Choudhry, Mr. Mahesh Kumar Jhajahdia, Mr. Rohtash Kumar and Ms. Munni Devi of Shikshit Rojgar Kendra Prabandhak Samiti, Jhunjhunu
- The survey in Gujarat was carried out with the involvement of Mr. Jikesh Shah of Yuva Chetna, Himmatnagar, Sabarkantha and his team, Mr. Giriraj and Ms. Nirmal Singh of Sarthi, Godhar, Panchmahal and their team, Dr. Has Mukh Kharecha of BAIF, Lachakdi, Navsari and his team, Vd. B. P. Parmar, Principal, Ms. Medha Jani, Head of the Department, Dravya Guna Vibhag of Akhand Anand Ayurved College, Ahmedabad and students of second year BAMS- Chetan Prajapati, Kiran Patel, Manish Sharma, Yogesh Oza, Daxesh K. Patel, Bhavesh R. Chauhan, Rudresh Pandya, Rajesh M. Patel, Kaushal Prajapati, L. Pandya, Kapil R. Modi and Bhaumik Prajapati and Kapil Modi of the J. S. Ayurved College, Nadiad.

- A large number of other NGOs who have helped us in this effort include – Dr. Satish Gogalwar of Amhi Amchya Arogyasathi, Maharashtra, Mr. Muthu of the covenant Centre for Development, Tamilnadu and Mr. Rajeev Khedkar of the Academy of Development Science, Maharashtra.
- Translation of the ADS book from Marathi and its summary was provided by Ms. Pallavi Chapekar, Pune
- The research staff from Centre for Indian Knowledge Systems, who helped in this effort are Mr. S. Thambidurai and Mrs. Nirmala Arunkumar, Botanists, Mr. K.S. Sudhakar, Ecologist and Vaidya K. Gowthaman, Ayurvedic Physician.
- Mr. S. Arumugaswamy has coordinated the field survey in the Kancheepuram district of Tamilnadu.
- Secretarial and computer work for compiling this document has been provided by Ms. J. M. Prabhavathy, Mrs. Meena Ananthanarayanan and Mr. S. Ramesh.

ANNEXURE I

IDENTIFICATION OF VARIOUS STAKEHOLDERS AND INFORMATION TO BE OBTAINED FROM THEM

IDENTIFICATION OF VARIOUS STAKEHOLDERS

The group felt that the major stakeholders from whom we should obtain data, information and inputs are the following.

- I. Households - Family use of flora, fauna and of course food stuffs.
- II. Folk medical practitioners.
- III. Collectors of raw drugs.
- IV. ISM practitioners consisting of practitioners of Ayurveda, Siddha, Unani and Swa-rigpa systems.
- V. State forest departments.
- VI. Industries
- VII. Academic and research institutions.

2. INFORMATION TO BE OBTAINED FROM VARIOUS CATEGORIES

The following is an overview of the kind of information that are to be obtained from various categories of stakeholders identified in section A above.

I. HOUSEHOLDS

- Use of Flora and fauna used for food and medicinal purposes, examples of special foods.
- Problem - Access to resources / Access to knowledge
- Immediate changes in the last ten years with respect to medicinal flora and fauna.
- Perception of households on Folk practitioners
- Top three problems of health due to biodiversity loss and the probable solutions
- Any other suggestions

II. FOLK PRACTITIONERS

- Floral and faunal species used for medicinal purposes.
- Access to resources.
- Problem
 - Of access and knowledge
 - Social recognition
 - In relation to industry
- Three major problems of health due to Biodiversity loss and probable solutions.
- Any other suggestions

III. DRUG COLLECTORS

- Access to resources
- Livelihood problems due to market forces
- Examples of sustainable collection practices
- Three major problems and probable solutions
- Any other suggestions

IV. ISM PRACTITIONERS

- Number of species used (flora and fauna)
- Suggestions regarding medicinal flora and fauna and their
 - Conservation
 - Access
 - Cultivation
 - Intellectual Property Rights (IPR)
- Biodiversity Act.
- About food and health
- Any other suggestions

V. STATE FOREST DEPARTMENTS

- Knowledge of the diversity of medicinal flora and fauna in the state forests.
- Status / identification of rare, endangered threatened medicinal flora and fauna.
- Strategy and plan to conserve medicinal flora and fauna.
- Data on species in trade from forests.
- Research / Data on sustainable levels of harvest.
- Changes in floral and faunal diversity and in habitat.

VI. INDUSTRY

- Number of species used, their volumes and sources.
- Percentage of material from cultivation and wild.
- Suggestions on
 - Conservation and cultivation
 - Laws regarding IPR, Access etc.
 - Standards of raw materials
 - Biodiversity act
- Three major problems of health due to biodiversity loss and the probable solutions.
- Any other suggestions.

VII. GOVERNMENT INSTITUTIONS

This includes institutions such as

- CSIR, DST, ICAR, MoEF, ICMR Institutions
- Institutions of National importance
- State Government institutions (eg. TBGRI)
- Universities
- Botanical Gardens Network

- Their schemes / programs / initiatives / studies on health related natural resources and biodiversity.
- Three major problems of health due to biodiversity loss and the probable solutions.
- Any other suggestions.

It was decided that based on the above points suitable questionnaires would be provided to obtain inputs from various stakeholders bearing the following points in mind.

1. Suitable examples should be provided
2. Health refers to both physical and mental health.

ANNEXURE II

THE RICHNESS AND DIVERSITY OF FOLK TRADITIONS

Folk traditions make use of a rich and diverse variety of natural products in multiple ways. Given below are tables that illustrate the diverse natural resources made use of by folk traditions (plant and animal products), different kinds of formulations used by them as well as multiple uses of plants.

A. THE DIVERSE NATURAL RESOURCES MADE USE OF BY THE LOCAL HEALTH TRADITIONS

Part/Product	Name of the resource	Used for
I. Plants		
1. Above ground parts		
Whole plant	Touch-me-not (<i>Mimosa pudica</i>)	Cuts and wounds
Leaves	Mint (<i>Mentha arvensis</i>)	Loose motion
Tender leaves	Guava (<i>Psidium guajava</i>)	Vomiting / toothache
Matured leaves	Basil (<i>Ocimum sanctum</i>)	Fever

Stem bark	Neem (Azadirachta indica)	Worms
Stem	Tinospora cordifolia	Diabetes
Wood	Sandal (Santalum album)	Headache
Resin	Asafoetida (Ferula asafoetida)	Indigestion
Galls	Karkata sringi	Expectorant
Gum	Neem (Azadirachta indica)	Cracks in the sole
Latex	Wrightia tinctoria	Skin diseases
Wax	Paveeta indica	Headache
Gel	Aloe (Aloe vera)	Coolant
Flower bud	Clove (Syzygium aromaticum)	Toothache
Flower	Hibiscus (Hibiscus rosa-sinensis)	White discharge
Stamens and style	Saffron (Crocus sativus)	Complexion
Fruit	Terminalia chebula	Indigestion
Endosperm	Coconut (Cocos nucifera)	White discharge
Fruit rind	Pomegranate (Punica granatum)	Dysentery
Fruit pulp	Indian laburnum (Cassia fistula)	Purgation
Seed	Kodasaga (Holorrhena antidysenterica)	Stomach ache
Bulbils	Dioscorea bulbifera	Indigestion, Stomach ache
2. Below Ground Parts		
Tuber	Asparagus racemosus	Lactation

Stolon	Sweet flag (<i>Acorus calamus</i>)	Indigestion
Root	Sarpagandha (<i>Rauvolfia serpentina</i>)	Snake bite
Rhizome	Turmeric (<i>Curcuma longa</i>)	Wounds
Root bark	Kodasaga (<i>Holorrhena antidyenterica</i>)	Dysentery
Corns	<i>Amorphophallus</i> spp.	Piles
Bulb	Garlic (<i>Allium sativum</i>)	Stomach ache, tooth ache
II. FUNGUS		
Mushroom	Plamanjal (<i>Polupores</i> spp.)	Mumps
III. ANIMAL		
Milk	Cow's milk	Enhance lactation
Meat	Chicken	Running nose
Honey	Bee honey	Anti diabetic
Egg albumen	Egg	Cut marks on the face
Fresh Egg	Egg	Cough
Animal fat	Chicken fat	Burns
Feather	Peacock feather	Vomiting
Hair	Horse hair	Warts
Blood	Pigeon blood	Paralysis
Excreta	Pigeon droppings	Chest pain
Urine	Cow's urine	Jaundice

B. DIFFERENT FORMS OF DRUG USED IN LHTs

Form of the drug	Example
Whole drug: The entire plant or any part used as such	Fresh rhizome of Ginger chewed for indigestion
Crushed drug: The drug is crushed into small bits and pieces	Crushed clovebuds (<i>Syzygium aromaticum</i>) used locally for tooth ache
Paste : It is the finely ground form of fresh drug/s either for internal consumption or for external application	Sandal paste is used in case of burns and scalds. Nutmeg powder mixed with honey and taken internally to arrest loose motion
Fresh juice : Squeezed liquid portion of the fresh drugs with or without water	Leaves of Thulasi are crushed and the juice extracted for curing cold/cough
Powder : Finely pounded particles of a dried drug	Triphala churna which includes Belliric myrobalan, chebullic myrobalan, and goose berry in equal quantity is used as a laxative.
Decoction: The strained and concentrated extract obtained after boiling the crushed drug/s in water and reduced to specified quantity	Decoction of Pepper, ginger and neem bark for fever
Ash : The burnt part of the drug after incineration	Ash of Peacock feather with honey for vomiting
Lehya : Semisolid form of a medicine prepared by mixing the powdered drug in a liquid base for ingestion	Dry ginger, pippali and pepper powder mixed with honey for productive cough
Porridge : The semi solid form of medicine prepared after cooking	Arrowroot (<i>Maranta arundinacea</i>) porridge for leucorrhoea
Lepa : Powder or paste in oil base, for external application	Turmeric powder in coconut oil for cuts and wounds

Thaila / Oil : Both the vegetable oil per se and medicated vegetable oil are used, oil is boiled with decoction or paste of drugs	Castor oil is sued for purgation Coconut oil is boiled with Bhringaraj leaf paste, for hair care
Balm : Essential oils in a waxy base	Eucalyptus oil balm for head ache
Medicated water : Water to which drugs are added, for both internal and external use	Vetiver roots are soaked in water overnight. This is sued as a refreshing drink during summer. Few drops of Eucalyptus oil are added to bathng water

C. RICHNESS OF FOLK MEDICINE

Several plant species are put to multiple medical uses by local communities. Examples of Ethno-medical plants with ten or more uses reported across ethnic communities in South India, are given in below

MULTIPLE USES OF PLANTS

Plant name	Reported number of uses
1. Centella asiatica	33
2. Pergularia daemia	23
3. Aristolochia indica	22
4. Inchnocarpus frutescens	22
5. Alistonia scholaris	19
6. Holarrhena antidysentrica	18
7. Trachyspermum ammi	16
8. Hygrophia auriculiculata	15
9. Trianthena portulacastrum	15
10. Semecarpus anacardium	15
11. Hemidesmus indicus	15
12. Catharanthus rosesus	14

13.	<i>Apama siliquosa</i>	13
14.	<i>Anacardium occidentale</i>	12
15.	<i>Costus speciosus</i>	12
16.	<i>Justica gendarussa</i>	11
17.	<i>Pergularia extensa</i>	10

ANNEXURE III

**LIST OF RED LISTED MEDICINAL PLANTS ASSESSED
THROUGH CONSERVATION ASSESSMENT AND
MANAGEMENT PLAN WORKSHOP
(CAMP)ORGANISED BY FRLHT**

Abbreviation: CR: Critically endangered; EN: Endangered; G: Globally; KA: Karnataka KL: Kerala; TN: TamilNadu; MAH: Maharashtra; AP: Andhra Pradesh; J&K: Jammu Kashmir; HP: Himachal Pradesh			
SI.No.	Species	Threat Status	Assessed Year
Southern India			
1	<i>Adhatoda beddomei</i> C. B. Clarke	CR/G	1995-99
2	<i>Eulophia cullenii</i> (Wight) Blume	CR/G	1995-99
3	<i>Heliotropium keralense</i> Sivar. & Manilal	CR/G	1995-99
4	<i>Janakia arayalpathra</i> J. Joseph & V. Chandras.	CR/G	1995-99
5	<i>Paphiopedilium druryi</i> (Bedd.) Pfitz.	CR/G	1995-99
6	<i>Piper barberi</i> Gamble	CR/G	1995-99
7	<i>Shorea tumbuggaia</i> Roxb.	CR/G	1995-99
8	<i>Syzygium travancoricum</i> Gamble	CR/G	1995-99
9	<i>Utleria salicifolia</i> Bedd.	CR/G	1995-99
10	<i>Valeriana leschenaultii</i> DC.	CR/G	1995-99
11	<i>Vateria macrocarpa</i> B. L. Gupta	CR/G	1995-99
12	<i>Piper mullesua</i> Buch.-Ham. Ex D. Don	CR/KA	1995-99
13	<i>Pueraria tuberosa</i> (Roxb. ex Willd.) DC.	CR/KA	1995-99
14	<i>Salacia oblonga</i> Wall. Ex Wight & Arn.	CR/KA	1995-99
15	<i>Salacia reticulata</i> Wight	CR/KA	1995-99
16	<i>Cosciniium fenestratum</i> (Gaertn.) Coleb.	CR/KA, KL, TN	1995-99
17	<i>Cycas circinalis</i> L.	CR/KA, TN	1995-99
18	<i>Plectranthus vettiveroides</i> (Jacob) Singh &	CR/TN	1995-99

	Sharma		
19	<i>Cayratia pedata</i> (Lam.) Juss. Ex Gagnepain var. <i>glabra</i> Gamble	EN/G	1995-99
20	<i>Cinnamomum wightii</i> Meisn.	EN/G	1995-99
21	<i>Decalepis hamiltonii</i> Wight & Arn.	EN/G	1995-99
22	<i>Dipterocarpus indicus</i> Bedd.	EN/G	1995-99
23	<i>Dysoxylum malabaricum</i> Bedd. ex Hiern	EN/G	1995-99
24	<i>Garcinia travancorica</i> Bedd.	EN/G	1995-99
25	<i>Gymnema khandalense</i> Santapau	EN/G	1995-99
26	<i>Gymnema montanum</i> (Roxb.) Hook.f.	EN/G	1995-99
27	<i>Humboldtia vahliana</i> Wight	EN/G	1995-99
28	<i>Hydnocarpus macrocarpa</i> (Bedd.) Warb.	EN/G	1995-99
29	<i>Nilgirianthus ciliatus</i> (Nees) Bremek.	EN/G	1995-99
30	<i>Plectranthus nilgherricus</i> Benth.	EN/G	1995-99
31	<i>Pterocarpus santalinus</i> L.f.	EN/G	1995-99
32	<i>Semecarpus travancorica</i> Bedd.	EN/G	1995-99
33	<i>Strychnos aenea</i> A. W. Hill	EN/G	1995-99
34	<i>Swertia lawii</i> (C.B.Clarke) Burkill	EN/G	1995-99
35	<i>Trichopus zeylanicus</i> Gaertn.subsp. <i>travancoricus</i> (Bedd.) Burkill	EN/G	1995-99
36	<i>Chonemorpha fragrans</i> (Moon) Alston	EN/KA	1995-99
37	<i>Drosera indica</i> L.	EN/KA	1995-99
38	<i>Michelia champaca</i> L.	EN/KA	1995-99
39	<i>Nothapodytes nimmoniana</i> (Graham) Mabber.	EN/KA	1995-99
40	<i>Saraca asoca</i> (Roxb.) Wilde	EN/KA	1995-99
41	<i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz	EN/KA,KE,TN	1995-99
42	<i>Ampelocissus indica</i> (L.) Planch.	EN/KA,KL,TN	1995-99

43	<i>Drosera peltata</i> J.E.Sm. ex Willd.	EN/KA,TN	1995-99
44	<i>Santalum album</i> L.	EN/KE,TN	1995-99
45	<i>Acorus calamus</i> L.	EN/KL	1995-99
46	<i>Operculina turpethum</i> (L.) Silva Manso	EN/KL	1995-99
47	<i>Oroxylum indicum</i> (L.) Benth. ex Kurz	EN/KL	1995-99
48	<i>Holostemma ada-kodien</i> Shultes	EN/KL	1995-99
49	<i>Adenia hondala</i> (Gaertn.) Wilde	EN/TN	1995-99
50	<i>Nervilia aragoana</i> Gaud.	EN/TN	1995-99
51	<i>Persea macrantha</i> (Nees) Kosterm.	EN/TN	1995-99
52	<i>Piper longum</i> L.	EN/TN	1995-99

Jammu Kashmir and Himachal Pradesh

53	<i>Aconitum chasmanthum</i> Stapf ex Holmes	CR/J&K	1998
54	<i>Arnebia benthamii</i> (Wall. ex G.Don) Johns	CR/J&K and HP	1998
55	<i>Dactylorhiza hatagirea</i> (D.Don) Soo	CR/J&K and HP	1998
56	<i>Fritillaria roylei</i> Hook.	CR/J&K and EN/HP	1998
57	<i>Gentiana kurroo</i> Royle	CR/J&K and EN/HP	1998
58	<i>Saussurea costus</i> (Falc.) Lipsch	CR/J&K and EN/HP	1998
59	<i>Aconitum deinorrhizum</i> Stapf	EN/J&K and EN/HP	1998
60	<i>Aconitum heterophyllum</i> Wall. ex Royle	EN/J&K and EN/HP	1998
61	<i>Angelica glauca</i> Edgew.	EN/J&K and EN/HP	1998
62	<i>Arnebia euchroma</i> (Royle) Johns	EN/J&K and EN/HP	1998
63	<i>Artemisia maritima</i> L.	EN/J&K	1998
64	<i>Betula utilis</i> D.Don	EN/J&K and EN/HP	1998
65	<i>Ephedra gerardiana</i> Wall. ex Stapf	EN/J&K	1998
66	<i>Jurinea dolomiaea</i> Boiss.	EN/J&K	1998
67	<i>Meconopsis aculeata</i> Royle	EN/J&K	1998

68	<i>Picrorhiza kurrooa</i> Royle ex Benth.	EN/J&K and EN/HP	1998
69	<i>Podophyllum hexandrum</i> Royle	EN/J&K and EN/HP	1998
70	<i>Nardostachys grandiflora</i> DC.	EN/HP	1998

Maharashtra

71	<i>Holostemma ada-kodien</i> Shultes	CR/MAH	2001
72	<i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz	CR/MAH	2001
73	<i>Chlorophytum arundinaceum</i> Baker	EN/MAH	2001
74	<i>Chlorophytum borivilianum</i> Sant. & Fern.	EN/MAH	2001
75	<i>Dipcadi ursulae</i> Blatt.	EN/MAH	2001
76	<i>Eulophia ramentacea</i> Lindl. Ex. Wight	EN/MAH	2001
77	<i>Eulophia nuda</i> Lindl.	EN/MAH	2001
78	<i>Fumaria indica</i> (Haussk.) Pugsley	EN/MAH	2001
79	<i>Iphigenia stellata</i> Blatter.	EN/MAH	2001
80	<i>Lamprachaenium microcephalum</i> (Dalz.) Benth.	EN/MAH	2001
81	<i>Nothapodytes nimmoniana</i> (Graham) Mabber.	EN/MAH	2001
82	<i>Operculina turpethum</i> (L.) Silva Manso	EN/MAH	2001
83	<i>Oroxylum indicum</i> (L.) Benth. ex Kurz	EN/MAH	2001
84	<i>Santalum album</i> L.	EN/MAH	2001
85	<i>Saraca asoca</i> (Roxb.) Wilde	EN/MAH	2001
86	<i>Thalictrum dalzellii</i> Hook.	EN/MAH	2001

Andhra Pradesh

87	<i>Cycas beddomei</i> Dyer	CR/G	2001
88	<i>Embelia ribes</i> Burm.f.	CR/AP	2001
89	<i>Litsea glutinosa</i> (Lour.) C.B.Robinson	CR/AP	2001
90	<i>Rauvolfia serpentina</i> (L.) Benth. Ex Kurz.	CR/AP	2001
91	<i>Acorus calamus</i> L.	EN/AP	2001

92	<i>Angiopteris evecta</i> (Forst.) Hoffm.	EN/AP	2001
93	<i>Anodendron paniculatum</i> A.DC.	EN/AP	2001
94	<i>Entada Pursaetha</i> DC.	EN/AP	2001
95	<i>Lasia spinosa</i> Thw.	EN/AP	2001
96	<i>Nervilia aragoana</i> Gaud.	EN/AP	2001
97	<i>Piper nigrum</i> L.	EN/AP	2001
98	<i>Plectranthus barbatus</i> Andr.	EN/AP	2001
99	<i>Plumbago indica</i> L.	EN/AP	2001
100	<i>Rhaphidophora decursiva</i> Schott	EN/AP	2001
101	<i>Santalum album</i> L.	EN/AP	2001
102	<i>Saraca asoca</i> (Roxb.) Wilde	EN/AP	2001
103	<i>Shorea tumbaggaia</i> Roxb.	EN/AP	2001
104	<i>Strychnos colubrina</i> L.	EN/AP	2001
105	<i>Zanthoxylum rhetsa</i> (Roxb.) DC.	EN/AP	2001
106	<i>Zingiber roseum</i> Rosc.	EN/AP	2001
107	<i>Boswellia ovalifoliolata</i> Balakr. & Henry	EN/G	2001
108	<i>Butea monosperma</i> (Lam.) Taub.	EN/G	2001
109	<i>Decalepis hamiltonii</i> Wight & Arn.	EN/G	2001
110	<i>Pimpinella tirupatiensis</i> Bal. & Sub.	EN/G	2001
111	<i>Pterocarpus santalinus</i> L.f.	EN/G	2001
112	<i>Syzygium alternifolium</i> (Wt.) Wall.	EN/G	2001
113	<i>Terminalia pallida</i> Brandis	EN/G	2001
114	<i>Urginea nagarjunae</i> Hemadri & Sahari	EN/G	2001

ANNEXURE IV
ALL INDIA COORDINATED RESEARCH PROJECT ON
ETHNOBIOLOGY

There are over 53 million tribal people in India belonging to 550 communities of 227 ethnic groups as per the classification made by anthropologists on linguistic basis. They inhabit in about 5000 forested villages or lead a nomadic life in the forest. Their vocations range from hunting-gathering to tribal societies with settled life and culture. Each tribal community has a distinct social and cultural identity of its own and speaks a common dialect. There are about 106 different languages and 227 subsidiary dialects spoken by tribals in India.

Tribal communities have a much closer relationship with nature and they can be expected to have richer and deeper linkages with bio-diversity (flora and fauna) not only for their livelihood but also for their medical and other needs. In this context it is interesting to look at the findings of the All India Coordinated Research Project on Ethnobiology.

The All India Coordinated Research Project on Ethnobiology (AICRPE) has, since its inception in 1982, adopted a multidisciplinary approach and involved at different stages about 24 research centres in the country for the in-depth study and analysis of manifold perspectives of Indian tribal life, culture and tradition. During its phase I period from 1982 to 88, ethnobiological study of about 65% of the tribal areas in the country was carried out and during phase II that started in 1989, exploration of more than 20% of the tribal areas was completed. It was concluded in 1998.

GENESIS OF THE ALL INDIA COORDINATED RESEARCH PROJECT ON ETHNOBIOLOGY (AICRPE)

The Indian Council of Agricultural Research convened a meeting of its inter-organizational panel for food and agriculture in 1976 under the Chairmanship of Dr. M S Swaminathan, the then Director General, ICAR. This panel decided to form a team of experts to examine the current status of ethnobiological studies of the tribal areas and to submit a report as to how the biological resources found in these communes could be conserved and utilized for the socio-economic improvement of the tribals on one hand and the country on the other. In September 1983, the Department of Environment set up a Coordination Unit at Regional Research Laboratory, Jammu with Dr. P. Pushpangadan as the Chief Coordinator of the project for overall supervision, coordination and implementation of various programmes of work outlined in AICRPE. AICRPE is essentially a multi-institutional, multi-disciplinary, action-oriented research programme. It aims at generating and documenting the multi-dimensional perspectives of tribal life, culture, traditions and their impact on the surrounding environment. The project further intends to preserve and conserve all those traditional beliefs and knowledge systems that promote conservation oriented practices and sustainable utilization of the local resources. This is in turn to develop or provide a scientific basis for sustainable resource management as well as to evolve appropriate welfare programmes to improve the quality of life of the tribal communities.

The project had covered about 80% of the tribal area and recorded invaluable data on Indian Ethnobiology, during the period 1982 – 1993.

Objectives

The line of approach to achieve the above goals of AICRPE includes :

1. Folklore survey, collection, identification and documentation of plants and animals used by tribals/hill people for food, fodder, fibre, dyes, medicine, treatment for snake bite etc. Inventory of economic insects like silkworm, lac, bees, termites etc.
2. Collection and conservation of plants used by the tribals/hill communities with special reference to primitive cultivars and wild relatives of cultivated/domesticated plants.
3. Collection and identification of indigenous germplasm of different species of animals with special traits.
4. Study on the impact of tribal culture on vegetation and wild life such as
 - (i) Reservation of the vegetation and animal life
 - (ii) Primitive agriculture and forestry operations
 - (iii) Shifting cultivation and
 - (iv) Hunting of wild life, etc.
5. Phytochemical and pharmacological screening and investigation of promising wild plants or plants parts / animal products used by tribals for medicine, pesticides etc.
6. Inventory of the wild edibles like roots, tubers flowers, fruits etc. and their nutritional evaluation to assess the nutritional status of tribal diets and formulation or recommendations related to nutritional deficiency and mode of supplementations in tribal dietary system.
7. Investigation on the skills and techno-economic capabilities of tribal people and development of location oriented production technology for the upliftment of tribal communities.
8. Collection, identification and documentation of plant and animal remains in prehistorical and historical perspective.
9. Investigation of the impact of several myths, totems and taboos observed by tribals related to conservation practices with regard to animals and plants.

Ethnobotanical Data - Findings

Ethnobotanical investigation has led to the documentation of a large number of wild plants used by tribals for meeting their multifarious requirements. Application of most of the plants recorded are either lesser known or hitherto unknown to the outside world.

Wild plants for food, medicine, fibre, fodder and other purposes

Over 9500 wild plant species used by tribals for meeting their varied requirements have been recorded so far. Out of 7500 wild plant species used by tribals for medicinal purposes, about 950 are found to be new claims and worthy of scientific scrutiny. Out of 3900 or more wild plant species used as edibles (as subsidiary food/vegetables) by tribals, about 800 are new information and at least 250 of them are worthy of attention to be developed as alternative source of food that the world would need in the near future. Similarly, out of over 525 wild plant species used by tribals for making fibre and

cordage, 50 are promising for commercial exploitation. Out of 400 plant species used as fodder, 100 are worth recommending for wider use and out of the 300 wild plant species used by tribals as piscicides and pesticides, at least 175 are quite promising to be developed as safe biopesticides. Almost all the plants used as gum, resin, dye, incense and perfumes are worth investigating since there is revived interest the world over for natural sources of these products.

Endangered plant species

The ethnobotanical survey teams were able to identify many endangered plant species. Some among them are economically very important. The team has further studied the possible causes of their threat. The important Western Himalayan wild medicinal plants that have now become endangered due to over exploitation and unscientific collection are: *Aconitum ferox*, *A. heterophyllum*, *A. balfourii*, *Angelica glauca*, *Atropa acuminata*, *Colchicum luteum*, *Delphinium denudatum*, *Disocorea deltoidea*, *Ephedra gerardiana*, *Heracleum canescens*, *Inula recemosa*, *Orchis latifolia*, *Juniperus communis*, *Paeonia emodi*, *Picrorhiza kurroa*, *Podophyllum hexandrum*, *Polygonum alpinum*, *Polygonatum verticillatum*, *P. graminifolium*, *Nardostachys grandiflora*, *Physochlaina praealta*, *Rhododendron hypenanthum*, *Skimmia laureola*, *Sorbus cuspidata*, *Swertia chirayita*, *Tanacetum longifolium*, *Typhonium diversifolium* and conifers like *Abies webbiana*, *Abies pindrow* etc.

The age old practice of shifting cultivation amongst the tribes of Eastern Himalayas had deteriorated the original forest habitat and the sites have become nonconductive for the growth of several rare and endangered species. These include wild relatives of fruit and vegetable species like *Citrus indica*, *C. assamensis*, *C. ichangensis*, *C. latipes*, *Musa cheesmanii*, *M. flaviflora*, *M. itinerans*, *M. velutina*, *M. sikkimensis*, *M. nagensium*, *Trichosanthes khasiana*, *T. majuscula*, *T. ovata* and *T. tomentosa* and the medicinal plants like *Cinnamomum cecidodaphne*, *Elaeocarpus sphaericus*, *Alpinia galanga*, *Chlorophytum arundinaceum*, *Rauvolfia serpentina*, *Hedychium spicatum*, *H. calcaratum*, *H. dekianum*, *H. robustum*, *H. tenuiflorum*, *H. wardii*, *Piper cubeba*, *Aristolochia bracteata*, *Dioscorea prazeri*, *Aconitum falconeri*, *Meconopsis betonicifolia*, *Microstylus wallichii*, *Nepeta khasiana*, *Gaultheria seshagiriana*, *Rheum emodi*, *Rhus hookeri*, *Valeriana wallichii*, *Viola falconeri*, *Vanilla pilifera*, *Dalbergia clarkei*, several *Rhododendron* species and conifers like *Abies delavayi* and *Pinus bhutanica*.

The threatened plants in the Western Ghats and peninsular region include *Canavalia stocksii*, *Dolichos bracteatus*, *Vigna radiata*, var. *setulosa*, *Sesamum laciniatum*, *S. prostratum*, *Vigna. Mungo*, var. *sylvestris*, *Atylosia grandiflora*, *A. nivea*, *Dioscorea wightii*, *Rauvolfia serpentina*, *R. barberi*, *Hemidesmus indicus*, *Tinospora malabarica*, *Capparis moonii*, wild relatives of *Piper nigrum*, *P. bracteatum*, *P. attenuatum*, *Lobelia inflata*, *Urginea indica*, *Amorphophallus commutatus*, *Curcuma inodora*, *C. amarissima*, *Gloriosa superba*, *Oryza jeyporensis*, *O. malampuzhaensis*, *O. nivara*, *Piper schmidtii*, *Curculigo orchioides*, *Abelmoschus tuberculatus*, *Psoralea spp.* etc. Wild *Sesamum indicum*, *Commiphora mukul*, *C. stocksiana*, *Withania coagulans*, *Chlorophytum borivilianum*, *Crinum brachynema*, *Tephrosia collina*, *Lobelia nicotianaefolia*, *Pterocarpus santalinus*, *Shorea tumbuggaia*, *Boswellia cordifolia*, *Terminalia pallida*, *Drosera peltata* etc. are some of the important threatened plants of peninsular regions. *Ailanthus kurzii*, *Canarium manii*, *Amomum fenzi*, *Dipterocarpus kerrii*, *Garcinia cadelliana*, *G. calycina*, *G. klainii*, *Mesua manii*, *Amoora*, *lawii* *Aglaiia fusca*, *Calamus*

nicobaricus, *Corypha macropoda*, *Calophyllum kunstleri*, *C. wallichianum*, *Hopea helferi*, *Myristica andamanica*, *Uvaria andamanica*, wild *Oryza spp.* etc. are some of the important endangered plants recorded from Andaman & Nicobar Islands.

Ethnozoological Data - Findings

Ethnozoological investigation of tribal predominated areas in 17 states viz., Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Gujarat, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Orissa, Rajasthan, Tamil Nadu, West Bengal have been completed by the Zoological Survey of India during the Phase I period (1982-88) of the project. The important findings emerged from this study are briefed below.

Wild animals for food, medicine and other purposes

The tribals use various wild and domesticated animals for food, drugs customs, game and religious purposes. Interesting but lesser known uses of many birds and animals for food, medicine, ornamental and religious rituals have been recorded.

About 76 species of animals have proved to be the vital source of tribal medicine. Of these, 16 species are invertebrates like insects, crustaceans, arachnids, molluscs etc. and 60 are vertebrates. The latter includes six species of pisces, one species of amphibia, nine species of reptilia, 16 spp. of aves and 29 spp. of mammalia including human beings.

The invertebrates are generally used as a whole, while in case of vertebrates, the body parts, tissues, exoskeletons, flesh, blood, bile, fat, bones, gastrointestinal tracts etc. are used. Likewise animal products such as honey, egg, milk, spider net, urine and faeces are of vital value in curing many diseases. The diseases known to be cured with the help of animal drugs are too many such as tuberculosis, rheumatic and joint pain, asthma, piles, pneumonia, night blindness, impotency, paralysis, weakness, cholera, body ache etc. In other words, to get diseases cured the dependable source of medicine was either plants or animals since the modern medicines were completely unknown to them. However, the overall development in recent times in the country is bringing rapid change in their disease treatment through modern medicine.

Different body-parts of various animals are widely used by tribals for a variety of domestic purposes. Dry shell *Unio* for scrapping, hairs of bear and horse for making rope, painting brush, coral for musical instruments, horns of buffalo for making buttons and combs, teeth of elephants for making bangles etc. are common practices among all the tribes. Deceased animal body, dropping of cow, buffalo and goat are widely used by the tribals as fertilizer in the crop field. Tribal community keep many animals like peacock, pigeon, parrot, mangoose, rabbit, hare, etc. as beloved pets in their houses. Fishing is an important vocation as well as hobby for the tribal people. They use earthworms, small fishes, frogs, insect larvae, flesh pieces etc for this purpose.

Animal products in tribal medicine

More than 25 animal products used in tribal medicine have been identified so far for scientific investigation. Of these, some important animal drugs deserve special mention in order of their relative importance.

Fat derived from more than 15 animals especially of the wild ones, seems to be very effective medicine in curing all sorts of pains including rheumatic pain. Fat is also used externally as a remedy for pain, impotency, skin burn and paralysis. Likewise there are many others such as flesh, blood, shell, feather, bile, urine, liver, intestine, milk, excreta, urine, dung, penis, egg, honey, leech, termites, flesh oil, musk, antler, ghee, yolk,

spider net, fish scale etc. which are used in medicine. The largest number of derivatives of a single species of bird is the hen's egg having 36 applications in curing a variety of diseases followed by the bird peacock with 22 applications mostly related to stomach complaints, body ache, small pox, chicken pox and whooping cough. Many of the animal drugs used by tribals are worth of further scrutiny for potential benefit to nontribal people.

RESEARCH ON PROMISING WILD EDIBLES AND ETHNOMEDICINAL PLANTS

Nutrition

Nutritional evaluation of about 200 wild edible plant species collected from tribal areas have so far been carried out. Constituents such as proteins, fats, sugars, starch, fibre and other components like sodium, potassium, calcium, phosphorus, iron, vitamin etc., were determined. It was noted that the tribals who still live in the undisturbed forest areas and having the traditional food habits (eating a large variety of seasonal foods that they get from the forests) are found to be healthy and free from most of the diseases. However, most of the tribals today are deprived of their traditional food choice due to depletion of forest resources and destruction of forest areas. These tribals are malnourished and are susceptible to many diseases. Measures to enable the tribals to have balanced food from the locally available resources have been suggested.

The nutritional analysis of certain pseudocereals (*Amaranthus polygamus* and *Fagopyrum esculentum*) traditionally eaten by the tribal and hill communities of high Himalayan areas showed that they are exceptionally very rich in good quality protein. It has the essential amino acid and lysine which are usually deficient in most cereals and millets. The nutritive value of these pseudocereals is found to be equal to that of casein. Similarly the nutritive analysis of leafy vegetables like *Lamium albus* used by the tribals of Gurez valley of Kashmir showed that they are rich in minerals and proteins (20.4% to 26%). But due to the change in food habits younger generations are discarding these high nutritive plants and this results in causing serious malnutrition. Every effort should be made to encourage the tribal and hill communities to include invariably the above plants in their food. It is, however, necessary to evolve better, high yielding strains of these plants suited to various other geographical regions and popularize them so that malnutrition problems of other tribal and rural populations in the country can be checked to a certain extent.

High protein sources were identified and potential sources for some useful chemicals were discovered from some plants. The seeds of *Cicer songaricum*, a wild plant growing in Ladakh area, was found to contain high protein and phospholipids. It also contains about 1% lecithin, equivalent to that present in bragg soyabean variety and this offers great scope for commercial exploitation. Lecithin is an important product used as viscosity reducer, emulsifier and wetting agent and there is great demand for this in pharmaceuticals, cosmetics and food industries. "Gabe muth", a local variety of soyabean present in the hill regions of Kashmir was also found to contain appreciable amount of lecithin. A unit for the production of lecithin was suggested for Ladakh, which could then generate great employment opportunities for the locals.

Investigations carried out on the oils of Olive (*Olea europaea*) grown in different Trans Himalayan regions have shown that the Olive grown in Himachal Pradesh is of very high quality as it has less iodine value and free acid percentage and therefore, it can find good

acceptability in the international market. Large scale cultivation of this variety of Olive for the socio-economic development of the locals is suggested. Commercial cultivation of one wild yam species (*Dioscorea sp.*) in the Kashmir region is also recommended.

Phytochemistry and Ethnopharmacology

Chemical investigation and biological screening of about 300 wild tribal medicinal plants have been carried out. Many known, a few lesser known, as well as unknown compounds with promising biological activity have been isolated from some of these species and their chemical and structural elucidations have also been made. Biological screening and phytochemical investigations of plants claimed to have potential medicinal properties are important not only for discovery of new therapeutic agents but also for the discovery of new sources of economic materials and precursors for the synthesis of complex chemical substances of biological or industrial importance. Plant species viz. *Canarium euphyllum*, *C. manii* (collected from Andaman forests), *Paeonia obovata* (collected from Western Ghats) and *Euphorbia acualis* (Collected from Madhya Pradesh) are found to be very effective against rheumatoid althritis and inflammation. *Adina cordifolia* and *Andrographis paniculata* (collected from MP) are found to have remarkable hepatoprotective and immuno-stimulant activities. Hepatoprotective and 100% antifertility activities were observed in compounds isolated from *Wedelia calendulacea* and *Kunstleria keralensis* respectively. *Trichopus zeylanicus* (collected from Agasthyar hills of Western Ghats) is found to have antifatigue and immunomodulating properties. These discoveries are of immense importance and it is hoped that some new and powerful medicines could soon be developed from the above plants. Detailed phytochemical, pharmacological and clinical investigations on these are now in progress.

SUMMARY

Since 1994, AICRPE seems to have disappeared from public space. It appears that in the current atmosphere of increased sensitivity about issues such as patents, IPRs, rights of tribal communities and access to bio-resources has lead to a situation where all the collected data is – “under wraps”. It is known that a final technical report was submitted to the Ministry of Environment and Forest in 1998 (Pushpangadan.P, 2002). However, the contents of this report are currently not available for public scrutiny.

ANNEXURE V
ANIMAL PRODUCTS USED IN AYURVEDIC SYSTEM OF
MEDICINE

It is known that traditional medical systems make use of varied products including – products of plant origin, animal origin, mineral origin and even synthetic products. In the light of the current requirements, we would limit ourselves to a review of what is known regarding the use of animal products in the major medical systems.

The Ayurvedic formulary of India makes a reference to about 27 products of animal origin in use in Ayurvedic formulations. The accompanying table (table) gives a list of those products groups them as per the species and giving their common name, Latin Name, Sanskrit Name and parts used. In certain cases the description of the sources is of such a nature that it is not possible to identify it as a single species (for example, Black snake, fish etc.).

Sl.No	Common Name	Latin Name	Sanskrit Name	Part(s) used
1	Goat	Family : Bovidae Genus : Capra	Aja	Milk/tooth/horn/bile/flesh/urine
2	Horse	Equus species	Asva	Tooth
3	Camel	Camelus dromedarius	Ustra	Tooth
4	Elephant	Elephas indicus	Hasti	Tusk/excreta
5	Hen	Gallus gallus	Kukkut	Shell of hen's egg
6	Black snake	Pseudoechis porphyriacus	Krsnasarpa	Poison of black snake
7	Deer	Cervus species	Krsnasara	Horn of the deer
8	Donkey	Famil : Equidae	Khara	Tooth
9	Civet cat	Family : Viverrida (Paradoxurus hermaphroditus - common civet)	Gandhamarjara	Semen of civen cat
10	Cow	Family : Bovidae	Go	Milk, urine, fresh liquid from cow dung, curd of cow's milk, ghee from cow's milk, horn
11	Ox	Bos indicus Family : Bovidae	Rocana	Horn of the ox, bile of the ox

12	Coral	(?)	Paviza	Coral
13	Earthworm	Annelids	Bunnaga	Earthworm as a whole
14	Fish	Pisces	Matsya	Bile
15	Honeybee	Apis species	Madhu	Honey/bee's wax
16	Peacock	Pavo cristatus	Mayura	Feather/bile
17	Buffalo	Bubalus bubalis	Mahisa	Bile, horn, milk
18	Pearl oyster	Pinctada species	Mukta	Shell of oster pearl/ pearl
19	Musk deer	Moschus moschiferus	Kasturi	Musk
20	Stag	Cervus elaphus hangler	mrga	Horn/skin
21	Rohu fish	Labeo rohita	Rohitamatsya	Bile
22	Swine	Sus scrofa cristatus	Varaha	Tooth, horn, bile
23	Tiger	Panthera tigris	Vyaghra	Nail
24	Conch	Conus species	Sanka	Conch/spiral part of conch
25	Oyster	Crassostrea species	Sukti	Shell of Oyster
26	Human milk	Homo sapiens	Nariksira	Human milk

The total of 27 species have been mentioned and their breakup is as given below

	Mammals	16		
	Birds	2		
	Reptiles	1		
	Fishes	2		
	Insects	5		
	Other	1		

	Invertebrates			
	Total	27		

A variety of products derived from animals is also described ranging from obvious things like flesh and milk and encompassing feathers, semen, exudates, etc. The use of full live animals is also mentioned. The accompanying table gives a list of some animal products mentioned which have been group product-wise

1	Milk	Goat/cow/buffalo/human beings		
2	Shell	Hen's egg/oyster pearl / oyster		
3	Butter	Cow		
4	Honey	Honey bee		
5	Wax	Honey bee		
6	Horns	Goat, deer, cow, ox, swine, stag, buffalo		
7	Tooth	Goat, horse, camel, donkey, cow, swine		
8	Tusk	Elephant		
9	Bible	Seine, rohu fish, buffalo, peacock, fish, goat		
10	Ghee	Cow's milk		
11	Curd	Cow's milk		
12	Excreta	New born elephant, cow		
13	Urine	Goat, cow		
14	Feather	Peacock		
15	Semen	Civet cat		
16	Flesh	Goat		
17	Skin	Deer		
18	Nail	Tiger		
19	Exudation (Musk)	Musk deer		

20	Live animals	Earthworm		
21	Pearl	Pearl oyster		
22	Coral	Coral		
23	Conch	Conch		

ANNEXURE VI

ANIMAL PRODUCTS USED IN SIDDHA MEDICINE

The list of a variety of animal products that have been mentioned is being used in Siddha Medicine has been made by a Siddha Physician (source Dr. Raji, Siddha Physician, Foundation for Revitalisation of Local Health Traditions, Bangalore). She has made a listing of 148 animals. The list of animals and animal products compiled by her is given in the accompanying table where we have produced the Tamil name Common name, Scientific name, parts used and also remarks in some specific cases. It has not been possible to identify the common name or scientific name in certain of the cases since there is a difficulty in correlation (Rajalakshmi, 2001)

Sl. No.	Tamil Name	Common Name	Scientific Name	Parts Used	Remarks
1	YûXF-	Short tailed bandicoot	<i>Nesokia indica</i>	-	-
2	LôhÓ Tu±	Wild Boar	<i>Sus scrofa</i>	Internal fat	-
3	Øs[m Tu±	Porcupine	<i>Hystrix indica</i>	Flesh	-
4	Øsù[-	Hedgehog	-	-	There are two genera of Hedgehogs
5	S-	Indian Fox	<i>Vulpes bengalensis</i>	-	-
6	¿o Sôn	Common Otter	<i>Lutra lutra</i>	-	-
7	JSôn	Wolf	<i>Canis lupus</i>	-	-
8	LôhÓ Sôn	Indian Wild dog (or) Dhole	<i>Cuon alpinus</i>	-	-
9	ÛTÛùL-	Bandicoot rat	<i>Bandicota indica</i>	flesh	-
10	×tù\-	Bush Rat	<i>Gollunda</i>	-	-

			<i>ellioti</i>		
11	×-	Tiger	<i>Panthera tigris</i>	Flesh	-
12	×àl̄léû]	Small Indian civet	<i>Viverricula indica</i>	Ventricle of the civet cat (where the perfume is generated)	-
13	YûW AÓ	Nilgiri Tahr	<i>Hemitragus hylocrius</i>	Flesh	-
14	Yvp F-	Indian field mouse	-	-	Two or more genera is found
15	ÅhÓ F-	House rat	<i>Rattus rattus</i>	Meat	-
16	Vôû]	Indian Elephant	<i>Elephas maximus</i>	Urine, teeth, tusks	paste made of nails of elephant (2 parts) copper sulphate (1 part), saffron (3 parts) in milk is applied for conjunctivitis
17	ÛNkSôn	Red Fox	<i>Vulpes vulpes</i>	-	-
18	ÛNqúY-	Indian gerbille	<i>Tatera indica</i>	-	-
19	IhPLm	Camel	<i>Camelus dromodarius</i>	Milk, Ghee and Urine	-
20	@Wdĩ	Lac	<i>Crateria lacca</i>	-	-
21	LôLm	House crow	<i>Corvus splendens splendens</i>	Flesh	-
22	@hûP	Speckled leech	<i>Hirudo medicinalis</i>	-	The animal is used for local abstraction of blood and also as an anticoagulant

23	Lvç¬	Musk-deer	<i>Moschus moschiferus</i>	Testicular extract	When the secretion is fresh it has an unpleasant urinary odour.
24	U«p	Peafowl	<i>Pavo cristatus</i>	Flesh and Fat	-
25	LÜRô¬	Grey Partridge	<i>Francolinus pondicerianus</i>	Flesh	-
26	Ï«p	Koel	<i>Eudynamys scolopacea</i>	Flesh	-
27	FÚûU	Buffalo	<i>Bos bubalus</i>	Milk	-
28	×\ô	Pigeon	<i>Columbia livia</i>	Flesh	-
29	,¬	Mongoose	-	Flesh	-
30	ÏŞûW	Horse	<i>Equus caballus</i>	Milk and Urine	Urine is beneficial against Ringworm and intestinal worms
31	ØVp	Rabbit	<i>Oryctolagus cuniculus</i>	Flesh	-
32	Øs[m Tu±	Indian Porcupine	<i>Hystrix indica</i>	-	-
33	AsLôh£ Th£	Red-wattled Lapwing	<i>Vanellus indicus</i>	-	-
34	@uPeLôdLôn	Jungle crow	<i>Corvus macrorhynchos</i>	-	-
35	£hÓdĭÚ®	House sparrow	<i>Passer domesticus</i>	-	-
36	LôûP	Quail		Flesh	More than two species of quails is seen in Tamilnadu
37	LôhÓ úLô¬	Grey jungle fowl	<i>Gallus</i>	-	-

			<i>sonneratii</i>		
38	ÚLô ⁻	Hen	-	Flesh	-
39	SôûW	Pond heron	<i>Ardeola grayii</i>	-	-
40	ζo LôLm	Cormarant	<i>Phalacrocorax niger</i>	Flesh	Flesh is demulcent
41	TfûN ×\ô	Green pigeon	<i>Crocopus chlorigastes</i>	Flesh	Flesh is easily digestable
42	UûPVôu	Paddy bird	<i>Ardeola grayii</i>	Flesh	-
43	RôWô	Lesser whistling teal	<i>Dendrocygna javanica</i>	Flesh	-
44	ÇdL]ôu ĨŨ®	Weaver bird	<i>Ploceus species</i>	Flesh	-
45	Ds[ôu	(a) Pintal snipe or (b) Fantail snipe	(a) <i>Gallinago stenura</i> or (b) <i>Gallinago gallinago</i>	Flesh	They are also known as úLôW Ĩj§
46	Yô]mTô¥	Lark	-	-	More than one genus is found
47	Lô]ôu úLô ⁻	(a) Indian blue-breasted banded Rail (b) Slaty legged banded crake	(a) <i>Rallus striatus</i> (b) <i>Rallina eurizonoides</i>	-	Both are found in wetlands (swamps)
48	AûU	Tortoise	-	Sheel	More than one genus is found
49	LW¥	Sloth bear	<i>Melursus ursinus</i>	Meat	-
50	Tu±	Pig	-	Meat	-
51	YôjÕ	Goose	<i>Anser indicus</i>	Flesh and eggs	Flesh and eggs are beneficial in cough, heart diseases and ulcers
52	YôûZ Áu	-	<i>Wallago attu</i>	-	-

53	®\ôp Áu	Murrel	<i>Ophiocephalus striatus</i>	—	—
54	@«ûW	Snake heads	<i>Channa marulis</i>	—	—
55	ÛNu]ô İu ²	Common Shrimp	<i>Paenaeus monodon</i>	—	—
56	Lô]ôu ùLiûP	Small carp fish	-	—	—
57	ÛLiûP	-	<i>Lates calcirifes</i>	—	—
58	ª\ôWp	Sand eel	<i>Ompok bimaculatus</i>	—	—
59	L\ûX Áu	Jew Fish	<i>Sciaena dussumieri</i>	—	—
60	LÚ YqYôp	Black pomfret	<i>Stromateus niger</i>	—	—
61	Ï\ûY	-	<i>Channa punctatus</i>	—	—
62	UpûY	Grey mullet	<i>Mugil cephalus</i>	—	—
63	§ÚdûL	Ray fish	<i>Dasyatis sephen</i>	—	—
64	DÛûY	Mud fish	-	—	—
65	®Xôeİ Áu	Eels	<i>Muraenesox cinereus</i>	—	—
66	AÓ	Goat	<i>Ovis aries</i>	Flesh	-
67	FÚûU	Buffalo	<i>Bos bubulus</i>	Flesh and Milk	Both are cardiac stimulants
68	TÑ	Cow	<i>Bos taurus</i>	Milk, ghee and cow dung	Plasters of cowdung act as an antiseptic
69	Aß Áu	River Fish			There are various species

					of river fishes
70	@βTRôéúLô [~]				
71	@« ^u W	Herring			
72	ÛNp ùLi ^u P	Shell Carp			
73	° ^u U Sôn	European dog			
74	° ^u U JSôn	European Wolf			
75	° ^u U Tu±	German Boar			
76	°] Tu±	Chine Hog			
77	áW LÚYôÓ	Dried Shark Fish			
78	Ïßm×	Milk Fish			
79	G- Áu	Lake Fish			
80	#	Lady's fly scarlet moth			
81	Lp ^u X°	Rufescent Tree rat			
82	L ^u W°	Black Rat			
83	LúeÏ ^u ®	Black Sparrow			
84	LPp SiÓ	Sea Crab			
85	LPp Sôn	Sea Dog			
86	LPt Tu±	Sea Hog			
87	LôhPôÓ	Forest Goat			
88	Lôh ^u P-	Jungle Rat			
89	LôhÓ Sôn	Wild Dog			
90	¡ZeLôu Áu	Indian Whiting			
91	#	Jerbora rat			

92	ĩQtß Áu	Well Fish			
93	ÙLôđĩ Ds[ôu	Small Snipe			
94	ÚLômûT	Poligar Dog			
95	ÚLôûW Ds[ôu	Long Snipe			
96	ÚLôW Lôû]	Bezoar		Ox gall is evaporated to 1/3rd adding alcohol, filtering, distilling & evaporating again	pecially indicated in measles & small pox to reduce excessive heat in the body
97	ÚLôhPôu	Rock horned owl			
98	Ï[m Áu	Pond Fish			
99	Ï\ûY	Spotted Dove			
100	UûXVôÓ	Mountain Goat			
101	UwùY-	Tree Rat			
102	#	Red ant		Eggs	
103	ØhTu±	Bengal porcupine			
104	ØjÕ £l©	Oyster	<i>Mytilus sp.</i>	Shell	
105	SjûR	Snail			
106	SôhÓ Sôn	Country Dog			
107	SôhÓ Tu±	Country Pig			
108	ÙSÚl× úLô̄	Ostrich			
109	©\ Sôn	Pariah Dog			
110	#	Earth Worm			There are more than one species

111	×tù\-	Bush rat			
112	R@hÓl×\ô	Bran Dove			
113	Ds[ô Áu	Sable Fish			
114	EodĭÚ@	Village Sparrow			
115	EolTu±	Village Pig			
116	DÓm×	Monitor Lizard	<i>Varanus monitor</i>	Flesh	
117	Yôu úLô ⁻	Turkey			
118	YwlùT-	Ridge Rat			
119	YvpSiÓ	Field Crab			
120	YvùX-	Field rat			
121	ÛYsù[Neĭ	White Conch			
122	ÛYsù[-	Grey rat			
123	ÚYhûP Sôn	Hound			
124	@kRUôu Tu±	Andaman Pig			
125	LmTe úLô ⁻				
126	£ß ×-				
127	£@lTh£				
128	BWôp				
129	LfNo LÚYôÓ				
130	LúeùLôdĭ				
131	LúeúLô ⁻				
132	LPp ùL-ß				
133	ĭÚh¥ Th£				

134	ÙLôp- LÚYôÓ				
135	UúXjúRu				
136	ÙLôm×júRu				
137	ÙLô¥VôÓ				
138	U l×\ô	Spotted Dove			
139	UwlùTôkÕj úRu				
140	UV¬ Áu				
141	ÙUÝí				
142	S ^a hÓl Th£				
143	TôûXVôÓ				
144	×tßjúRu				
145	YiQl×\ô				
146	Y¬l×\ô				
147	ÙYsû[YqYôp				
148	@dĩ°				

There have been a total of about 150 species listed which includes mammals, birds, reptiles as well as lower animals. The break-up is given in the accompanying table about 20 different kinds of products derived from various animals are also being described as used. Besides this, there are also some animals and the are used live such as - leech, dove, etc.

VARIOUS ANIMAL PARTS AND PRODUCTS USED

S.No	ANIMAL PART or PRODUCT	EXAMPLE
1	Flesh	Pig, Cat, Dog, Tiger etc
2	Milk	Cow, Goat ,Camel

3	Shell	Tortoise,Oyster
4	Ghee	Boar,Crow,Wolf
5	Butter	Cow
6	Buttermilk	Camel
7	Honey	-
8	Wax	-
9	Eggs	Hen, Geese, Red ants
10	Horns	Cow
11	Tusks,teeth	Elephant
12	Dung	Cow
13	Ventricle	Civet
14	Conch	-
15	Urine	Camel, Cow, Elephant
16	Feathers	Peafowl
17	Bones	Tiger
18	Nail	Elephant
19	Exudations (Musk, Lac)	Musk deer, Lac insects
Live animal is also used ex . Leech, Dove ...		

ANNEXURE VII

ANIMAL PRODUCTS USED IN THE UNANI SYSTEM OF MEDICINE: SOME ILLUSTRATIONS

1. Amber
2. Mushk
3. Khara Teen (Earthworm)
4. Beerba-Boti
5. Dandan-E-Feel (Tusk)
6. Khusyatus-Salab
7. Mahi-Rubiyan (Prawn)
8. Geroon
9. Reg Mahi (Sand Lizard)
10. Aqrab (Scorpion)
11. Afai (a variety of serpent)
12. Maghz Sar-e-Kanjashk (Brain of Bird)
13. Sang Sarmahi (Stone of the Head of Fish)
14. Jund Bedaster
15. Charbiyan (Fat-animal)
16. Paneer Maya (Paneer)
17. Khoon Khargosh (Rabbit-blood)
18. Sartan (Crab)
19. (Ghee_ - Roghan Gaw
20. Mava Shuter-E-Arabi (Camel's muscle fat)

ANNEXURE VIII

DATA FROM FOURTEEN NATTU VAIDYA CONVENTIONS HELD DURING 1995 - 1996

BACKGROUND

During the years 1995-1996 a series of fourteen meetings which were conventions of Nattu Vaidyas was organised by FRLHT in Tamil Nadu, Kerala and Karnataka. These meetings were attended by a large number of Vaidyas and on this occasion the Vaidyas were interviewed and data was collected from them. The 1188 vaidyas who attended the 14 meetings held in the three states are drawn from 96 Taluks spread over 598 villages. The venues at which the meetings took place and the number of Vaidyas who participated in each of these meetings is given in Table-I. There is also a map which gives the venues of these meetings (Map-1). The Centre for Indian Knowledge System was entrusted with the task of translating, computerising and analysing, this data and the information in this section is based on their report (Balasubramanian A.V., 1999)

DESCRIPTION OF THE DATA

There were a total of fourteen meetings conducted of which eight were held in Tamil Nadu, four in Karnataka and two in Kerala. The total number of participants in this meeting was 1188 with participants in a single meeting ranging in number from 29 to 258. Each of the participants was interviewed and data was collected on various aspects of their knowledge and practice. The data was collected in each case and recorded in the respective regional language, namely Tamil for meetings held in Tamil Nadu, Kannada for meetings held in Karnataka and Malayalam for meetings held in Kerala. The names of diseases treated and medicinal plants used were also of course given in the regional language.

TABLE-I

LIST OF NATTU VAIDYA CONVENTIONS

Sl.No.	MEETING VENUE	NO. OF PARTICIPANTS	Table	Village
TAMIL NADU STATE				
01.	Kamarajar District	103	11	47
02.	Madurai District	258	12	94
03.	Tirunelveli District	100	8	44
04.	Coimbatore District	104	10	52
05.	Villupuram District	45	5	26
06.	Nagapattinam District	55	5	27
07.	Kanyakumari District	113	4	70
08.	Salem District	74	16	58

STATE TOTAL			71	418
KERALA STATE				
09.	Palakkad District	56	2	34
10.	Tiruvananthapuram District	74	4	26
STATE TOTAL			6	60
KARNATAKA STATE				
11.	Mysore District	29	5	15
12.	Bellary District	91	5	46
13.	Bangalore Rural District	35	5	18
14.	Tumkur District	51	4	41
STATE TOTAL			19	120
GRAND TOTAL		1188	96	598

REPORT ON THE POOLED DATA FROM ALL MEETINGS

This report is the pooled data from all the fourteen meetings have taken place in the three states of Kerala, Tamil Nadu and Karnataka. It is data collected from a total of 1188 Nattu Vaidyas comprising of 896 male and 292 female vaidyas. A vast majority of the vaidyas namely 469 of them (39.5%) have less then 10 years of experience while next largest group namely 322 vaidyas (27.1%) have between 10 to 20 years of experience. The number of vaidyas who are very experienced (more than 40 years of experience are 41 in number (about 3.5 %). In terms of the source of training it is seen that by and large it is a family tradition with about half the total number of vaidyas (392 + 105 = 497) having learnt from their father or their mother. Besides the family the major mentions are - parampara or specific person. It is seen that the tradition is being continued fairly satisfactorily with more than 75% of the vaidyas stating that they are propagating their knowledge to other students. Again it is interesting to see that while a large number of vaidyas are propagating the tradition to members of the family, a large category of vaidyas is also teaching to - "anybody interested".

In terms of diseases treated there is a spectacular range and variety with the leading conditions being - jaundice, fever, headache, abdomen pain, cough, cold, asthma, diabetes, fistula and skin diseases. Surprisingly the most frequently mentioned condition is skin diseases by 207 vaidyas. Perhaps this reflects to some extent, the conditions for which the clients preferred traditional medical treatment.

THE USE OF MEDICINAL PLANTS

In all the total medicinal plants that have been mentioned as being used are 766 species of which *Adathoda zylanica*, *Ocimum tenuiflorum*, *Phyllanthus amarus*, *Eclipta prostata* and *Acalypha indica* are the top five. It appears that in terms of the source of medicinal plants the major sources are the Local collector and Shops with Self collection and procurement from agents being the less important sources in that order. Again in terms of plants that are difficult to get 312 species have been mentioned with the plants - *Polygala glabra*, *Centella asiatica*, *Eclipta prostata* heading the list. There is also a list of over 400 plants that in the opinion of the vaidyas can be grown in a home garden. In terms of identification of plant names it is seen that about 10% of the total names have not been identifiable. Looking at the analysis of the completeness of the data it is seen that questions 7, 9 & 11 are most often answered incompletely.

ANNEXURE IX

TRIBAL MEDICINAL TRADITIONS AT KARJAT, WESTERN GHATS, MAHARASHTRA

The Academy of Development Science (ADS) has been working in the tribal areas of Karjat taluka for several years. It has documented the traditional medicinal knowledge of the tribals of Karjat taluka. Vaidya Ramdas Palekar, an Ayurvedic doctor, carried out the difficult job of approaching the 'Vaidus' (as the tribal medical practitioner is locally called) and documenting the various medicines prescribed by them. Mr. Palekar actually visited all the tribal areas and studied the people, their social life, surrounding animals, birds, plants etc. Vaidya Sanjay Dakhore later classified the collected data scientifically, tried to find Ayurvedic basis for these medical practices, distinguished those traditions which do not find a reference in Ayurvedic texts.

Based on those experiences, ADS published a book in 1998 (Palekar.R and Sanjay Dhakore 1998). The information in this section is based on the English summary of the book produced by a researcher (Chapekar, Pallavi, 2001) and an article based on personal communication from ADS (Balasubramanian A.V., 1995)

Geography

The area of the present study is Karjat taluka which is situated among the Sahayadri mountain range in Maharashtra. Kashele is a town in Karjat taluka of the Rajgad District of Maharashtra State. The Karjat tribal block has a population of 30,000 distributed in 44 villages.

Tribal localities are generally divided into 'Gavthan', 'Wadi', and 'Pada'. Gavathan is the place where generally the higher caste people and important persons of the village live. Panchayat offices of some villages are located here. Localities associated with them are called Wadi or Pada. For instance Jamruk village will have Jamruk Gavathan and several Padas associated with it like Dukarpada, Thombarpada etc. The names of villages or wadis are generally based on the plants, animals, birds, religion, landscape etc which are predominant in that area. eg. Borichi wadi. Some derive their names from saints, gods or famous persons or families of that locality. Because of such naming systems we come to know the speciality of that area. This book contains a list of around 50 Gavathans and 112 Wadis of the tribals in Karjat taluka.

Karjat tribal areas have a humid climate throughout the year with heavy and regular rains in the monsoon and it is hot in the summer. Average yearly rainfall is 302 mm. Average daily temperature in summer is 31.8 °C. Average humidity in rainy season is 80% and in the rest of the year 65-75 %

Tribals of Karjat

Karjat taluka has a predominance of Katkari tribals. Mahadev koli and Thakur are the other tribes found here. They differ in their dialects and dressing methods. Katkari tribals are also called as Katodi. They make cath from *Acacia catechu* hence the name. They

earn their living by working as laborers in the fields. They make coal and catch fish. They also sell fuelwood , fodder, flowers etc. The Thakurs generally settle on mountain tops far from other settlements. Thakurs build their houses at night. After seeing the Polestar(Dhruva tara) in the sky they start constructing the base. At dawn they build the first Pillar and the construction is completed the next day by dawn .Their main source of income is agriculture. They hunt small animals like porcupine , mongoose etc. Thakurs are very brave people. They also have a lot of knowledge about medicinal plants. They believe that plants can feel emotions and can become happy or sad. **Mahadev Kolis** stay in groups of 12 families and show good team spirit. They are very courageous and even today there are incidents of husband and wife killing a leopard. Marriage between different groups is not allowed and generally the boy marries the daughter of his maternal uncle. They have a very unique way of catching crabs. In April-May crabs go deep in the burrows, so to catch them they rub small stones on a big stone near the burrows because of which the crabs come out.

The study of traditions till now has been confined to cultural aspects like music, folk music etc.. But no one has so far worked on tribal medicines.

The book produced by ADS is divided into 10 chapters viz:

1. Geographical location
2. Importance of Geographical regions
3. Tribal culture
4. Tribal diet
5. Medicinal Traditions
6. Unconventional methods of treatment (Todage)
7. Plants
8. Animals
9. Usefulness of finding Ayurvedic names of diseases
10. Classification of diseases according to Ayurveda

Traditional Medical Practitioners : Types and their specialization

1. 'Vaidu' General Physician : Treats general diseases with medicines prepared from plants, animals and minerals
2. 'Suin' - Gynecologist: Delivery and post-natal care
3. 'Potdhari'- Assistant Gynecologist : Assists Gynecologist at the time of delivery
4. 'Hadvaidu' – Bone setter

5. 'Dagvaidu' - Treats diseases by branding with a heated rod
6. 'Visha Chikitsak' - Treats ailments caused by various poisons
7. 'Bhagat' - Treats diseases caused because of God's ire, mental ailments
8. 'Bhagatin' - Treats diseases caused because of God's ire, mental ailments in women
9. 'Mantrik' - Treats people haunted by ghosts, spirits and mental ailments
10. 'Pashuvidya' - Veterinary doctor : treats cattles animals

In Karjat taluka there are approximately 100 general practitioners, 225 gyanecologists, 250 assistant gyanecologists, 40 orthopaedics, 50 Dagvaidus, 30 Vishachikitsak, 30 Bhagat, 20 Bhagatins, 15 Mantriks and 50 veterinary doctors

Predominant diseases/disorders in the Karjat tribal area:

Disorders like burning sensation of the skin, increase in body temp, excessive sweating , oozing of blood from the mouth and nose, yellowing of eyes, tongue, certain skin diseases , Conjunctivitis, lethargy, vertigo, anemia, fever etc.

Diet

Food is consumed after performing certain 'Sanskar' on it to remove unwanted quality or increase the good qualities. These Sanskars are simple like cooking the vegetable or adding certain things like tamarind or jaggery etc. A detailed account of 46 vegetables which have medicinal properties is given. These are classified according to the edible part used eg. Leafy vegetable leaves are used to make vegetables. By interviewing around 56 families, widely eaten food items and the general diet of the people was found out.

- Seven types of foodgrains are consumed but rice and *Eleusine coracana* (Singer Millet) are the commonest.
- Around 10 types of cereals are eaten but *Dolichos lablab* is eaten more often.
- From around 14 vegetables whose fruits are used as vegetables. Bringals, cucumber, drumstick, ladysfinger are eaten more often.
- Around 6 tubers and roots (kandamula) are eaten like potatoes, onions etc.
- There are around 15 leafy vegetables which are collected from the wild and around 5-6 are grown in their fields.
- Around 15 birds and animals are hunted for food, the most common being wild boar, rabbits, crabs, He goat etc. besides several species of fish .
- The book describes the way in which different food items are consumed. eg. which grains are polished, which cereals are soaked, which vegetables are dried and then consumed, which parts of animals or birds are eaten, which animals are roasted, which are fried, what dishes are made from foodgrains etc

- A list is also given of the food items and the season in which they are eaten.

The tribal medical practitioners are well versed with medicinal properties of different plants and provide a range of medicines for different ailments like fever, dysentery, piles, indigestion, anemia, tuberculosis, cough, asthma etc. Eg. For fever *Adathoda vasica* + *Azadiracta indica* juice is given to the patient . For dysentery, burn the leaves of *Tectona grandis* , mix it with water add lemon juice and drink this solution.

Unconventional methods of treatment of the Vaidus (Todaga) :

Unconventional methods of treatment of the Vaidus or Todaga as it is called in Marathi are generally associated with black magic, mantra-tantra etc. In case of Karjat tribals today these are mostly limited to sacrificing an animal or wearing certain things on certain days or offering certain things to particular Gods. Around 37 such examples are listed which are advised by the tribals for different ailments ranging from fever to tuberculosis. eg . In order to treat fever, the roots of *Achyranthus aspora* along with a black thread should be tied to the upper arm on Saturday. For Asthama it is advised to boil frog leg in water and then drink that water.

Flora

A list of various plants used by the tribals, its Latin, Sanskrit and Marathi names, its part used and the name of the medicine prepared from it or its medicinal value forms an important part of the book. The list contains 229 plants.

The Vaidus have certain rules to be followed before making medicines

1. Medicines should be prepared fresh for use.
2. Plants grown near the crematorium, sacrificial posts and other such unauspicious spots are not used for making medicines.
3. Generally the medicine is prescribed till the disease is completely cured. Sometimes there is a specific period for which the medicine is to be taken.
4. Medicine should be identified by the vaidu himself.
5. The medicinal plant to be brought should be invited on the previous day and then it should be saluted before plucking.

There are certain methods for preparation of the medicines. 20 such methods are listed eg.

1. Leaves, flowers should be crushed to obtain the juice
2. While using the bark of the tree use the inner layers.
3. While storing seeds, store them along with the outer covering
4. While using fruits generally juice is extracted or the peels are removed and then the fruit is eaten.

Fauna

As the tribals mostly stay in forest areas they have a keen observation of animals. The tribals for making medicines use different body parts of different animals. We find a lot of information in some ancient texts notably the 'Mrigapakshishastra' by Hansdev. This book contains a list of 62 local birds, 36 local animals and 12 aquatic and amphibian animals, part of the body used and for what reason(food/medicine) and its availability.

The natural resources used in the treatment include-

Plants :

Trees.....163

Shrubs236

Creepers105

Total.....504

Animals :

Wild animals 21

Pet animals 10

Fish and other aquatic animals.....3

Total.....34

Birds

Wild Birds..... (approximate) 30

Pet Birds2

Total32

Minerals

Non-metals (lime, red ochre) 5

Metals (Iron,copper)5

Total 10

TABLE : PLANTS SPECIES USED AS MEDCINES BY TRADITIONAL PRACTITIONERS

HABIT OF PLANT	NUMBERS USED AS MEDICINE
Trees	168
Shrubs and Herbs	207

Climbers and Creepers	105
Grasses	13
Epiphytes, Parasites and Lower plants	509

Examples of Plant Species Used as Medicines by Traditional Practitioners

TREES

LOCAL NAME	BOTANICAL NAME	PART	USE
Avala	<i>Emblica officinalis</i>	Bark	Toothache
Amba	<i>Mangifera indica</i>	Bark	Diarrhoea
Gal	<i>Randia brandisti</i>	Fruit	Emetic
Karanj	<i>Pongamia pinnata</i>	Seed	Skin diseases
Palash	<i>Butea monosperma</i>	Seed	Stomach worms
Khair	<i>Acacia catechu</i>	Bark	Skin diseases
Umbur	<i>Ficus glomerata</i>	Root	Measles
Vad	<i>Ficus begalensis</i>	Latex	Cracks in soles
Jambhul	<i>Syzigium cumini</i>	Bark	Diarrhoea, dysentery
Moha	<i>Madhuca indica</i>	Bark	Cracks in soles

TABLE : PLANT SPECIES USED AS MEDICINES BY TRADITIONAL PRACTITIONERS

SHRUBS AND HERBS

LOCAL NAME	BOTANICAL NAME	PART	USE
Erand	<i>Ricinus communis</i>	Leaf	Jaundice
Peva	<i>Costus speciosus</i>	Stem	Thirst quencher
Aghab	<i>Achyranthes aspera</i>	Whole plant	Scorpion bite, toothache
Nirgudi	<i>Vitex negundo</i>	Leaves	Joint pain, fever, cold

Dhataki	Woodfodia fruticosa	Flowers	Red discharge
Chakramarda	Cassia tora	Seeds	Ring worm, scables
Adulas	Adhatoda vasica	Leaves	Cough
Kumari	Aloe vera	Leaves	Burns
Rui	Calotropis gigantea	Leaves	Swelling
Jasvand	Hibiscus rosasinensis	Flowers	Red discharge

**TABLE : PLANT SPECIES USED AS MEDICINES BY TRADITIONAL PRACTITIONERS
CLIMBERS AND CREEPERS**

LOCAL NAME	BOTANICAL NAME	PART	USE
Pingvi	Celastrus paniculata	Seeds	Eye ailments
Gulvel	Tinospora cordifolia	Stem	Fever
Shatavari	Asparagus racemosus	Root	Galactogogue
Kavali	Hemidesmus indicus	Root	Blood purifier
Kapitkacehu	Mucuna pruriens	Seed	Strength promoter
Sagargota	Caesalpinia crista	Seed	Stomach ache
Dudh Kand	Ipomaea digitata	Root	Strength promoter
Gunj	Abrus precatorius	Leaves	Sore throat
Pahadvel	Cissampelos pareira	Root	Snake bite
Kadu karanua	Dioscorea bulbifera	Bulbils	Edible

**TABLE : PLANT SPECIES USED AS MEDICINES BY TRADITIONAL PRACTITIONERS
GRASSES**

LOCAL NAME	BOTANICAL NAME	PART	USE
Vala	Vetiveria zizanioides	Root	Cooling
Durva	Cynodon dactylon	Root	Cooling,Red discharge

Kasai	Coix lachryma-jobi	Root	Urinary ailments
Kothera	Eragrostis mucronata	Root	Dhobi itch

TABLE : EXAMPLES OF SOME ANIMALS USED AS MEDICINES

LOCAL NAME	PART USED	USE
Dukkar	Fat	Wounds, Cracks in the sole
Javadya	Flesh	Strength promoting
Khekada	Whole	Cold, cough, Asthma
Beduk	Legs	Asthma
Ghorpad	Head, Flesh	Bleeding piles, Strength promoter
Kasav	Head	Arsha, Bleeding piles
Gadhav	Urine	Asthma, Skin diseases
Kabutar	Blood	Asthma
Haran (chittal)	Horn	Swelling and wounds
Hahis	Milk	Measles

TABLE : SOME MINERALS AND METALS USED AS MEDICINES

NAME OF MINERAL	USE
Geru (Gairik)	Shitta pitta
Varulachi Mati (Ant Mud)	Swelling, bites
Chuna (Lime)	Dog bite, Mumps
Stones/sand	Fomentation
Tambe (Brass)	Dog bites
Lokhand (Iron)	“Daag” (spot)

Importance of identifying Ayurvedic names for a disease

In this whole study about the tribals around 125-135 diseases were listed. Some of the diseases could be easily understood and the equivalent Ayurvedic name for the disease identified. However in some cases it was impossible to identify the disease from the name given by the tribals. Since Ayurveda is a fairly established science identification of corresponding ayurvedic names for tribal diseases helps in verification of the treatment methods prescribed by the tribals. The book ends with the Ayurvedic system of classification of diseases.

Thus this book has done an important task of documenting the tribal medical knowledge. ADS suggests that this type of study should be done throughout India because:

1. It is an important part of culture and useful to future generations.
2. It is an important collection of medical knowledge and practices.
3. It will serve as an important database for fighting patent cases.
4. Due to rapid urbanization our cultural , social, religious and medical traditions are fast becoming extinct. So such books will help us to revive and spread these traditions
5. Such books will be an important source of information for the scientists.

ANNEXURE X

NATIONAL POLICY ON INDIAN SYSTEMS OF MEDICINE – IN SUMMARY

- 1) India has a rich heritage of well codified health care systems of life – Ayurveda and Yoga, continuously practiced since Charaka, Sushruta and Patanjali (1000-500 BC). Ayurveda, Unani, Siddha and Yoga & Naturopathy have for centuries met the health needs of the people long before the advent of western medicine and are still popular due to their accessibility, affordability and effectiveness. Side by side, huge opportunity is growing worldwide as Complementary and Alternate medicine (as it is referred to in the west) rapidly grows in economic importance, heightened with concerns about the adverse effects of chemical drugs and escalating costs of modern health care. The first comprehensive policy on ISM has been prepared which addresses the strengths of the systems in areas of current relevance, while delineating the immense opportunities that lie ahead.
- 2) The national ISM Policy builds upon the positive features of the indigenous systems as also Homoeopathy which include their diversity and flexibility; their modest cost; a low level of technological input and the growing popularity of natural plant-based products. The latter movement opens fresh opportunities for the production of a whole range of therapeutics and also for food supplements, cosmetics, toiletries, nutraceuticals and veterinary medicine. The National ISM Policy seeks to maximize these opportunities by recommending a range of strategies.
- 3) While the Policy tries to build upon the existing infrastructure, it is also acutely aware of the major problems daunting this sector and which have deterred it from attaining a high level of performance whether in education, research or clinical practice, a few exceptions notwithstanding. The need to increase their relevance, credibility and professionalism is given priority in the national ISM Policy. So also, the need to enforce Good Manufacturing Practices and put in place an acceptable level of regulation and enforcement covering the manufacture and certification of drugs. The bulwark of the policy reinforces the Resolutions of the Central Council for Health & Family Welfare – the highest Constitutional body set up in the health sector for the formulation of the policy which has strongly advocated systematic use of ISM in the primary and secondary health infrastructure.
- 4) The Policy recognizes the new vistas opened through the untapped potential of the medicinal plants sector in India, one of the 8 important global centres for plant diversity, being rich in medicinal and aromatic plants occurring in diverse ecosystems. Enormous opportunity exists worldwide not only for ISM but for the growth of the herbal sector. The policy addresses how the growth of this sector can be encouraged using the experience and scientific base of institutions of CSIR and Biotechnology, ICAR and Forestry Research so that efforts lead to

sustainable conservation and cultivation practices, a unique selling prospect for trade and an immense export opportunity.

- 5) Issues relating to Intellectual Property Rights have also been addressed through the policy, mainly with a view to forestall the grant of patents for the medicinal use of plants which have long been in use in Ayurveda and other codified Indian Systems of medicine. Opening up of this knowledge in four U.N. languages, through the internet, in a selective way can also be an immense tool for academics and scientists outside the ISM sector, to have access to the classical authoritative texts in Sanskrit, Urdu, Tamil and other regional languages. The policy provides for creating linkages between and across sectors to derive maximum advantage from the effective use of this valuable knowledge.
- 6) Side by side, the protection of the knowledge on local health traditions and use of locally available herbs in primary health care built upon years of experience of families, tribal people and villagers is also addressed, together with the need for selective validation of such practices. Integration of the most significant and useful strategies of ISM and traditional knowledge into the Reproductive Child Health Programme has also been incorporated, supported by operational research studies and efficacy trials.
- 7) The scope for using ISM as plank to further tourism and culture, encourage academic exchange with scientific and technological institutions in India and abroad, foster international collaboration with countries with an interest in this area, has also been given emphasis in the policy with the objective of propagating what is good and useful in ISM to a much larger constituency. The effort in the policy is to reach out to the world, through the Mission abroad, to globalise ISM and build upon the opportunities that lie ahead.
- 8) The Policy makes a strong case for allocating a meaningful share of the Central and State health budgets for ISM. It favours the growth of this sector as a useful companion to complement medical and health care while pointing to new opportunities where ISM can excel.
- 9) The Policy recognizes the role of ISM & H physicians in various National Health & F.W., programmes and enumerates strategies for utilizing the human resources and plant based products more effectively.
- 10) Special assistance would be paid to the development of traditional medicine in the North Eastern States after identifying local and tribal medical practices germane to the region.
- 11) The policy seeks to build up the credibility of the ISM sector by encouraging certification and quality marking of products to set at rest the present concerns about quality, safety and efficacy. It also seeks to make the products of research percolate for the direct benefit of the common man while aiming at increased access, commercial viability and global competitiveness.

- 12) Legislative changes to cover Nutraceuticals and Food supplements which are neither drugs nor food would be introduced.
- The Drug & Cosmetics Act would be amended to cover intermediate or partially processed plant based products.
 - A new Act which targets the ISM sector in a positive way in the area of consumer information titled “ISM Product Information, Promotion and Regulation Act” would be introduced.
- 13) The policy offers the ISM industry policy support and taxation incentives to acquire high standards of manufacture.
- 14) The national ISM Policy identifies the ensuing research priorities and supports evidence based research to determine the efficacy of ISM drugs and therapies; generation of data on safety and standardization. The need to retrieve, review and preserve rare classical manuscripts, which are lying scattered in libraries abroad, and in many Indian homes is recognized as another area for medico-historical research. Last but not the least the Policy targets research into the fundamental principles of Ayurveda, Unani and Siddha – a task which should have been taken up many years ago.

ANNEXURE XI

TASK FORCE ON CONSERVATION AND SUSTAINABLE USE OF MEDICINAL PLANTS : EXECUTIVE SUMMARY AND RECOMMENDATIONS

A. EXECUTIVE SUMMARY

- i) “Health for All” continues to be a distant dream for India. With the increase in life expectancy and the problems of over crowding, air and water pollution, degenerative disease stress, allergies, diabetes, rheumatic and arthritic conditions, neurological conditions, memory disorders are likely to grow. Currently, about 85 per cent of women are anaemic on account of iron deficiency and 2.2 million children are afflicted with cretinism while another 6.5 million are mildly retarded. About 1.1 lakh women die every year of causes related to pregnancy and childbirth. This can affect the quality of life, productivity and the well-being of future generations. The health of women is especially important because if children are born to sick mothers, there will be problems in their later life.
- ii) Our per capita annual consumption of drugs of Rs.125 is the lowest in the world mainly because medicinal plants constitute the principal health care resources for the majority of population. The World Health Organisation (WHO) estimated that 80% of the population of developing countries rely on traditional medicines, mostly plant drugs, for their primary health care needs. Also, modern pharmacopoeia still contains at least 25% drugs derived from plants and many others, which are synthetic analogues built on prototype compounds, isolated from plants. Transition from synthetic drugs and microbially produced antibiotics to plant based drugs is rapidly gaining acceptance. Global resurgence in the use of plant based drugs is an opportunity for India to attain self-reliance and boost the export of herbal drugs.
- iii) The demand on plant based therapeutics is increasing in both developing and developed countries due to the growing recognition that they are natural products, being non-narcotic, having no side-effects, easily available at affordable prices and sometimes the only source of health care available to the poor. Medicinal plants sector has traditionally occupied an important position in the socio-cultural, spiritual and medicinal arena of rural and tribal lives of India. The global thrust areas for drugs from medicinal plants include disease conditions, whose incidence is increasing and where the modern drugs are either unavailable or unsatisfactory.
- iv) In a wider context, there is a growing demand for plant-based medicines, health products, pharmaceuticals, food supplements, cosmetics, etc., in the national and international markets. Conservation and sustainable use of medicinal plants are issues on which immediate focus is required in the context of conserving biodiversity and promoting and maintaining the health of local communities, besides generating productive employment for the poor with the objective of poverty alleviation in tribal and rural areas.

- v) International market of medicinal plants is over US \$ 60 billion per year, which is growing at the rate of 7%. India at present exports herbal material and medicines to the tune of Rs.446.3 crores only which can be raised to Rs.3000 crores by 2005. China and India are two great producers of medicinal plants having more than 40% of global biodiversity. China, besides meeting its domestic requirement is earning US \$ 5 billion per year from herbal trade. There is thus an enormous scope for India also to emerge as a major player in the global herbal product based medicines. **However, this requires a grand strategic plan, which takes a holistic view of the entire situation to boost the export of Rs.10,000 crores by 2010 and minimising the import.**
- vi) Medicinal plants are used at the household level in a self-help mode. One and a half million practitioners of ISM&H use medicinal plants in preventive/promotive and curative applications. There are about 4,60,000 registered practitioners of ISM&H using medicinal plants in the codified streams. Further, there are 7843 registered pharmacies of ISM and 851 of homeopathy and a number of unlicensed small-scale units. Besides meeting national demands, they cater 12% of global herbal trade. Pharmacies are mostly owned by family companies and most of them are secretive in trade and largely unregulated.
- vii) At present, 90% collection of medicinal plants is from the wild, generating about 40 million mandays employment (part and full) and since 70% of plants collections involve destructive harvesting many plants are endangered or vulnerable or threatened. Currently medicinal plants are collected without paying attention to the stage of maturity. They are stored haphazardly for long period of time under unsuitable conditions. This results in deterioration in quality. Such materials are not acceptable to importers and standard manufacturing drug units.
- viii) Marketing of medicinal plants is inefficient, informal, secretive and opportunistic. As a result, the raw material supply situation is shaky, unsustainable and exploitative. This results in depletion of resource base, exploitation of rural people (who are the real stewards of the resource), adulteration and non-availability of quality herbal drugs for domestic consumption as well as for exports.
- ix) As the price paid to the gatherers tends to be very low, they often “mine” the plants, as their main objective is to generate income. A critical factor in wild harvesting is the availability of cheap labour to undertake the very labour intensive work of herbal gathering. Women are the main gatherers and also the users. With the rampant deforestation, women have to cover greater distances for the collection of herbs that once grew almost outside their habitation. As forest habitat disappear and overharvesting for commercial use reduces the stocks of wild medicinal plant material, there is a corresponding drop in the availability of the plants normally used as the first and last resort for all health care by rural population.

- x) Despite the wealth of resources (biological, human and financial) available, the sector has not developed in the absence of suitable standardisation, quality control and efficacy of drugs. It has yet to formalize and organise marketing and trade and integrate the development of medicinal plants from production to consumption to boost export of herbal formulations.
- xi) Medicinal plants sector has a number of stakeholders having divergent interests. Each stakeholder is interested in strengthening specific aspects of his sector only and ignoring the overall development. Unless coordinated efforts are made the sector cannot develop.

- xii) Several constraints exist due to inadequate awareness; inadequate investments in research and development; manufacturer – exporter dissonance; lack of quality and standardization norms; and lack of adequate marketing and trade informations.
- xiii) The emergence of the new intellectual property regime in the light of India's joining WTO will pose important challenges in this sector. The task force recommended several actions that were needed on the part of the government, institutions, etc. to strengthen India's capacity in the protection of its intellectual property rights. In particular, creating digital databases of India's traditional knowledge was recommended as a priority activity to provide the evidence of this knowledge in the public domain as well as India's ownership of the knowledge. Modernisation of the Patent office and the Trade Mark Register is long overdue. R & D institutions have to maximise their patenting efforts.
- xiv) The Task Force recognizes that apart from the software industry, the pharmaceutical sector is the only one showing a constant growth of 15% and more. Medicinal plants can be viewed as a possible bridge between sustainable economic development, affordable health care and conservation of vital biodiversity. For sustainable and equitable development of the sector, the task force recommends the following programmes:
- Establishment of 200 Medicinal Plant Conservation Areas (MPCA), covering all ecosystems, forest types and subtypes preferably inside the protected areas already notified under the Wildlife Act.
 - Medicinal plant species which are rare or endangered or threatened should be identified and their ex-situ conservation, may be attempted in the established gardens, plantations and other areas.
 - Three gene banks created with the financial assistance of Department of Biotechnology should properly store the germplasm of all medicinal plants.
 - Two hundred "Vanaspati Van" may be established in degraded forest areas (with an area of about 3500 - 5000 hectares each). Intensive production of medicinal plants from these "Vanaspati Vans" will produce quality herbal products and generate productive employment to 50 lakh people, specially women, who are skilled in herbal production, collection and utilization. "Vanaspati Van" should be managed under JFM for benefit sharing to avert poverty of tribals.
 - One million hectares of forest area rich in medicinal plants (about 5000 hectares each at 200 places) should be identified, their management plans formulated and sustainable harvesting encouraged preferably under the JFM system. Such areas, besides producing herbal products will generate employment for 50 lakh tribals on sustained basis and greatly help to alleviate poverty.

- Apart from CSIR, ICAR and ICFRE institution's engaged in medicinal plants about 50 NGOs, technically qualified, should be entrusted the job of improving awareness and availability of planting stock and agro-techniques for cultivation of medicinal plants. As recommended Twentyfive species having the maximum demand should be cultivated under captive and organic farming.
- All attempts should be made for medicinal plants screening/testing/clinical evaluation/safety regulation as well as research and development. Safety, efficacy, quality control, pharmacopoeia development should be expedited and completed by 2003.
- Policy, legal and institutional supports should be extended to the sector for adopting standards, quality control, efficacy and effectiveness of herbal drugs.
- Drug Testing Laboratories for ISM&H products should be established with qualified staff to test the plant/mineral based products. Training should be imparted to the laboratory staff, drug inspectors and to the quality control managers/in-charges of the manufacturing units so that they are able to identify the raw-materials for the presence of essential properties of medicinal plants.
- To prevent patenting of our traditional knowledge by outsiders, all the available information should be properly formatted in a digital form by using international standards for wider use both at the national and international level. Efforts should be intensified to create an Indian Traditional Knowledge Base Digital Library.
- The Task Force strongly recommends establishment of "Medicinal Plant Board" for an integrated development of the medicinal plants sector. It is expected to formalize and organize medicinal plants marketing and trade, coordinate efforts of all the stakeholders of the sector and ensure health for all by improving the awakening and availability of herbal products, besides generating productive employment to 10 million tribals and women on a regular basis. The "Medicinal Plant Board" will need a financial assistance of Rs.50 crores over a period of three years.
- Ten major medicinal plants identified for export should be extensively studied and appropriate literature on every aspect of such plants may be made available in the world market.
- Medicinal plants sector for its integrated development will need a financial assistance of Rs.1000 crores over a period of 5 years. Besides the national efforts external funding may be explored to ensure "Health For All" by 2005 itself.

B. CONCLUSION AND RECOMMENDATIONS

Conclusion

Earlier chapters of this report have highlighted following facts about medicinal plants sector in India:-

- i) The sector has traditionally occupied an important position in the socio-cultural, spiritual and medicinal arena of rural and tribal lives of India. In recent years, due to growing recognition of natural products and processes in sustaining human, cattle and environmental health, the economic as well as environmental importance of the medicinal plant resources have increased tremendously.
- ii) The World Health Organisation (WHO) estimated that 80% of the population of developing countries rely on traditional medicines, mostly plant drugs, for their primary health care needs. Also modern pharmacopoeia contained at least 25% drugs derived from plants and many others which are synthetic analogous built on prototype compounds isolated from plants.
- iii) The growing importance of herbal remedies in the developed countries has attracted the attention of all. Psychiatric disorders and neurodegenerative diseases require collaborative research. For brain related disorders synthetic drugs have only partial answers. Many medical practitioners see ISM&H systems happily co-existing with allopathy in the new millennium. The medicinal plants being natural, non-narcotic, having no side-effects and effective in treatments for ailments like cerebral malaria, cardiac diseases, hepatitis, arthritis, jaundice, mental disorder, premature aging, general immunity, stress related diseases, diarrhoea, etc.
- iv) Ethnobiological survey indicated that about 8000 species of medicinal plants are used as food, medicine, phytochemicals, biocides and other products. Medicinal plants are used at the household level in a self-help mode. Over one and half million practitioners of ISM&H use medicinal plants in preventive, promotive and curative applications. There are 7843 licensed pharmacies of ISM in addition to 857 in Homeopathy and a number of unlicensed small scale processing units manufacturing drugs. International market of medicinal plants related trade is over US \$ 60 billion per year and growing at the rate of 7%. India's export is around Rs. 447 crores per year only.
- v) At present 90% collection of medicinal plants is from wild, generating about 40 million mandays employment. Current practices of harvesting are unsustainable and responsible for depletion of resource base. Marketing of medicinal plants is inefficient, imperfect, informal, secretive, and opportunistic. As a result, the raw-material supply situation is shaky, unsustainable and exploitative.

- vi) Medicinal plants are collected without paying attention to the stage of maturity, dried haphazardly and stored long period under unsuitable conditions hence deteriorate in quality. As the price paid to the gatherers tend to be very low they often “mine” the plants as their main objective is to generate income. A critical factor in the wild harvesting is the availability of cheap labour to undertake the very labour intensive work of gathering.
- vii) Several medicinal plants have been assessed as endangered, vulnerable and threatened due to overharvesting or unskillful harvesting in the wild. Habitat destruction in the form of deforestation is an added danger. Since rural communities still depend on herbal medicines, **sometime it is the only source of health care available to them.**
- viii) There is a growing demand for natural product based medicines, health products, pharmaceuticals, food supplements, cosmetics etc. in the national and international markets. For meeting demand cultivated material is infinitely more appropriate for various uses. Systematic cultivation of medicinal plants needs following research and development support:-
 - a) Good agricultural practices which will include appropriate selection, identification, propagation methods, cultivation techniques, harvesting, stepwise quality control of raw-material upto processing stage, post harvest treatment, storage and safety.
 - b) Development of protocols for producing planting materials with desirable agronomic and therapeutic chemical derivatives.
 - c) Genetic transformation techniques to be developed and standardised.
 - d) Organic farming of medicinal plants as per world demand.
- ix) World over about 100 plant species are yielding 120 chemical compounds for modern pharmaceuticals. These chemicals are isolated in following ways:-
 - a) Isolation of active compounds for formulation into drugs (quinine, reserpine, digoxin etc.)
 - b) Isolation of intermediate compounds for production of semi synthetic drugs.
 - c) Preparation of standardised galenicals (extracts, powders, tinctures etc.)
- x) Medicinal plants sector spans a number of stakeholders having divergent interests. They include:-
 - a) The Government of India and State Governments, including the Ministries of Agriculture, Environment and Forests, and Health.
 - b) Traders and manufacturers.

- c) Scientist, researchers and research institutions (including quality control labs).
 - d) Relevant Non Governmental Organisations which improve awakening and availability of medicinal plants and which serve as representatives of communities of collectors and users of plants and plant derived drugs.
 - e) Consumers
 - f) Collectors and cultivators of medicinal plants.
 - g) International networks in which India is represented and international organisations concerned with the broader aspects of biodiversity.
- xi) The control of quality of the raw materials, finished products and of processes is an absolute necessity if one has to produce goods for world market and human consumption. The quality requirements for medicinal plant preparations are stringent in terms of active principles and toxic materials. Quality has to be built into the whole process beginning from the collection/cultivation of herbs to the final product reaching the consumer. Standard preparations need to be developed to improve quality, efficacy and effectiveness of the traditional drugs.
- xii) The developed countries are exerting tremendous pressure on developing countries by patenting medicinal plant products and processes. In USA patents have been obtained on active ingredients of Neem, Turmeric, Basmati Karela, Gurmar, Brinjal etc. All attempts should be made to identify traditional formulations and knowledge relating to process and products and patents may be obtained to the extent possible. The vital question of property right to developing countries for the use of know-how and genetic resources in the development of modern drugs has to be discussed and final solution to be derived.
- xiii) Medicinal plants sector in India operates in policy vacuum. Immediate action is needed to produce clearly defined policies to regulate medicinal plants conservation, cultivation, marketing and trade, exports, domestic drug production and coordination efforts and information. Although the sector is largely informal but it works in practice. However the constraints are likely to have an increasing impact, resulting perhaps in a crisis situation in near future.
- xiv) Despite a wealth of resources (biological, human and financial) being available the lack of coordinated approach has resulted in the simultaneous under-utilisation and overexploitation of medicinal plants. **For sustainable and equitable development of the sector and to avert a crisis, creation of “Medicinal Plants Board” should be expedited.** Similar boards were set up for tea, coffee, cardamom and spices trades. This board will certainly pave the way for development of medicinal plants sector for health care, generation of employment and ecological upgradation.

Strategy

In terms of sustainable development of medicinal plants sector, there are five obvious targets, most of which are recognised by the government and people.

Focus on Environment and Biodiversity conservation especially forests, wastelands, gardens, sacred groves etc. as these continue to be the primary habitat for medicinal plants, and linkages with incentives related to their conservation, sustainable harvesting and rehabilitation of degraded areas.

Systematic cultivation of medicinal plants by adopting following techniques:-

- a) Selection of plants (best pheno, geno and chemotypes) for cultivation being demand and market driven
- b) Development of high yielding varieties
- c) In vitro propagation
- d) Organic farming

Quality control and standard preparations. Genuineness of the plants to be ensured for maintaining quality and standard of Pharmaceutical preparations of crude extracts, decoctions and compound formulations. Assessment of safety and efficacy of herbal drugs for health improvement of poor as well as rich.

Formalising and organising the market and trade. India has comparative advantages in the market and can generate a stronger presence globally.

Policy and institutional arrangement for conserving, enhancing and sustainable utilising the medicinal plants resources.

Action Programmes

- i) Establishment of 200 Medicinal Plants Conservation Areas (MPCA) covering all ecosystems, forest types and sub-types in the country. Details as per annexure XVI.
- ii) About 100 medicinal plants classified as endangered or rare or threatened should be grown in well established gardens of the country. Such gardens are mainly managed by Agriculture, Horticulture, Forest Departments & Botanical Survey of India.
- iii) Three gene banks created through Central Institute for Medicinal and Aromatic Plants in Lucknow, National Bureau of Plant Genetic Resources in New Delhi and Tropical Botanical Garden and Research Institute in Trivendrum should properly store germplasm of all medicinal plants.
- iv) Attempt should be made to establish 200 “Vanaspati Van” in forest areas (each having an area of about 5000 hectares) for commercial supply of crude drugs to pharmacies and for exports. The vanaspati van should be managed by a registered society headed by Divisional Forest Officer (details as per annexure XVII).
- v) Forest Departments should identify and stockmap areas rich in medicinal plants. A “Management Plan” should be formulated for such areas

(MPDA). Intensive management should aim sustainable harvesting and quality production of herbal drugs (details as per annexure XVIII).

- vi) Forest Departments should effectively regulate extraction and transport of medicinal plants from wild. It should maintain a list of petty traders, private agents, wholesale dealers and final consumer of medicinal plants.
- vii) About 50 NGOs (including agricultural universities) technically qualified may be identified for improving awareness and availability of seeds and planting material of medicinal plants to people interested in their cultivation.
- viii) Twenty five species which are in great demand (listed in chapter III of the report) may be encouraged for cultivation. Contract and organic farming should be encouraged.
- ix) Quality and pharmaceutical standards of herbal drugs should be finalised early to establish faith of the users in the domestic and international markets.
- x) For formalising and organising the marketing and trade of medicinal plants “A National Medicinal Plants Board” should be established. The board should include representatives from the various stakeholders.
- xi) Herbal gardens may be established in each “Development Block” under Rural Development schemes.
- xii) Active principles of important medicinal plants to be determined and their quality improved by combination of biotechnology and genetic engineering.
- xiii) Search for new molecules, development of new drugs their standardisation and patenting have to be given priority.
- xiv) Appropriate policy, legislation & financial supports should be extended to the sector for greening the country, generating productive employment and supporting health care.
- xv) All efforts to be coordinated to ensure export of herbal products to earn Rs. 3000 crores by 2005 and Rs. 10000 crores by 2010 A.D besides meeting domestic needs.

Financial Assistance Required

- i) National Afforestation & Ecodevelopment Board’s (NAEB) scheme on “Non-Timber Forest Produce including Medicinal Plant” should be bifurcated carving out a separate scheme on Medicinal Plants development. The scheme should aim to establish 200 Medicinal Plants

Conservation Areas in Protected Areas with the help of Wild Life Wings of the states. The scheme may need an expenditure of Rs. 50 crores.

- ii) Scheme of establishing “Vanaspati Van” of Department of Family Welfare should continue during the 9th Five Year Plan. An additional amount of Rs. 750 crores will be needed to complete establishment of 200 “Vanaspati Van” in the country.
- iii) Forest areas rich in medicinal plants should be identified and management plan to be formulated for their intensive and sustainable harvesting. For formulating such 200 management plans an amount of Rs.50 crore will be required.
- iv) “Scheme of improving awakening and availability of Medicinal Plants” through NGOs should continue. About 50 technically qualified NGOs should motivate the farmers to carry out contract and organic farming of medicinal plants. Additional amount of Rs. 40 crores will be needed for providing know-how on growing medicinal plants and quality planting material to the farmers.
- v) For formalising and organising the marketing and trade of medicinal plants and to boost export establishment of “Medicinal Plant Board” is essential. It will need financial assistance of Rs. 50 crores.
- vi) For developing pharmacopoeial standards and quality control of herbal drugs Department of ISM&H will need additional support of Rs. 50 crores.
- vii) For developing invitro culture, biotransformation transgenic propagation of super chemotypes Department of Biotechnology will need additional support of Rs. 10 crores.

Thus an amount of Rs.1000 crores will be needed over a period of 5 years for comprehensive development of Medicinal Plants sector. The sector is expected to generate employment to 100 million people in the process of cultivation/regeneration, collection, drying, grading and processing of medicinal plants.

