

Revitalizing Medicinal Plants Sector in India – Opportunities and Challenges*

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Abstract

India is bestowed with unique diversity of ethnic culture, natural resources and bioedaphic and topographical features. Owing to the rich plant biodiversity, particularly the medicinal plants and ancient cultural background, India ranks one of the few countries in the world which is utilizing the enormous indigenous medicinal plant wealth in a big way since vedic era. The importance of herbals both as medicine, cosmetics, dye etc. and as food supplements, has been overlooked for quite sometime. However, in the recent past, with the advent of herbal revolution, the medicinal plants are looked upon not only as a source of affordable health care but also as a source of income developing in to an industry itself. The extensive use of medicinal plants from wild has brought about its serious depletion in nature.

Medicinal plants sector in India is vast and complex because of the rich plant biodiversity, multidimensional usage, large number of stakeholders from various fields in GOs. and NGOs. etc. The continuous use of medicinal plants through illicit harvesting and trade from the wild, shortage, volatile prices, lack of regulations, quality control etc. has further complicated the problem. As such the medicinal plants sector though developing day by day is totally unorganized and needs urgent attention of all the major stakeholders including the GOs. and NGOs., before it is too late.

In the present communication, based on information procured from multiple sources, an attempt has been made to putforth a glimpse of the vast Medicinal Plants Sector in the country and discuss some important aspects. While presenting a brief background, data on domestic and global scenario, source, conservation/cultivation, the users, trade (including export/import), herbal heist, constraints and government initiatives, remedial measures etc. have been discussed briefly.

Introduction

The instinct to collect and use a plant drug for healing is as old as human civilization. This fact has been well substantiated in one of the oldest repository 'Atharvaveda' (2500 -5000 B.C.), where there is a reference stating "A Kirat tribal girl digging drug on high ridges with lustrous shovel" (Atharvaveda - 0/4/14). India has glorious tradition of health care system, which dates back to the Vedic era. 'Rigveda', which is the oldest known repository of human

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knowledge and wisdom (5000 - 2500 B.C.), mentions about hundred medicinal plants used by the Aryans while in Atharva veda (2500 - 2000 B.C.) elaborate description and properties of medicinal plants are given. Later in 'Samhita' period, the science of life was established on scientific footing. The other ancient traditional systems like Greek, Persian, Roman, Unani, Chinese, Tibetan etc, also have a long history of using plants as an integral part of their traditional healing systems. However, these ancient systems including the Chinese had borrowed generously from the Materia Medica of India. Pupil from countries like China, Cambodia, Indonesia and Baghdad used to come to ancient Universities of Takshila (700 BC) and Nalanda (500 BC) in India to learn Ayurveda. There were regular trade between and by these countries with India mainly to obtain the precious drugs and spices. These medical systems were popularly practiced and the experience of healing was recorded, documented and became part of Materia medica of these countries. The Indian systems of medicine (ISM) particularly Ayurveda, Siddha and Unani during earlier period have achieved high level of growth and development. This period can be remembered as the Golden period in the history, particularly the Samhita period.

The colonial period particularly 18th and 19th centuries in India saw a popular preference, particularly in urban areas for the western system of medicine called 'allopathy', using mostly chemicals for healing. It became popular because of fast action, quick relief, palatability and western patronage. Introduction of western medicine largely damaged the ISM and was considered as a third grade system equated with witchcraft. Fortunately, the ISM particularly Ayurveda/ Siddha/ Unani survived not only in the rural areas in India but also in other parts of the world. However, after a lapse of nearly 200 years, post independent India paid attention for the revival of the ISM because of the hazardous - effects of antibiotics, cortisones etc. As on today, the ISM particularly Ayurveda has attracted global attention, because of the holistic approach to human healing and the use of safe, cheap herbal medicines. The plants are now extensively used not only as pharmaceuticals, but also as nutraceuticals, cosmetics, galenicals etc.

The use and cultivation of medicinal plants in the past was a part of our culture and therefore not much importance was given earlier. Now it is a new concept to use them variously and cultivate them on large scale. It is not only looked upon as a source of affordable health care but also as an industry and a source of income. The enormous use of medicinal plants in the recent past from the wild source has brought about depletion and extinction of some of the medicinal plants. It has become a serious matter of concern for the ISM,

which mainly rely on rich medicinal plant biodiversity and bioresources. The unregulated harvesting, trade, fluctuating prices etc. has largely affected the medicinal plants sector in the country. Presently the medicinal plants sector is unorganized without any forceful policy and regulation. In the present communication an attempt has been made to peep in to different facets of this vast, complex and very important Medicinal plants sector. This sector has direct impact on the manufacture of the life saving drugs, health care system and also economy of our country.

Medicinal Plants Sector (Domestic Scenario)

Medicinal Plants Wealth

India is one of the 12 mega-biodiversity countries harbouring two unique 'biodiversity hot-spots' out of 18 hot spots in the world. It is rich in all the three levels of biodiversity i.e. species diversity, genetic diversity and habitat diversity. It has all known types of agro-climatic, ecological and edaphic conditions with unique biogeographical areas having all known types of ecosystems ranging from coldest place, the dry cold desert of Ladakh (Nubra Valley with -57°C), to temperate, alpine and sub-tropical regions of north-west and trans-Himalayas; rain forests with high rainfall; wet evergreen humid tropics of Western ghats, arid and semi-arid regions of peninsular India; dry desert conditions of Rajasthan and Gujarat to the tidal mangroves of Sunderban (Anony. 2000). Under such unique and varied agroclimatic/bioedaphic conditions variety of medicinal plants grow. Out of 17,000 flowering plants, 8,000 species (MoEF, AICRPE-report) are used medicinally in local health traditions and codified systems of medicines. The intraspecific variability of the flowering plants found in the country make it one of the highest in the world. In Ayurveda, Siddha and Unani systems of medicine about 2,000 plants are used in various formulations. We have yet to explore and exploit medicinal properties of unexplored remaining species. Large sector of communities in the rural areas, which constitute about 75% of the Indian population, inhabiting in about 5,76,000 villages located in different climatic conditions, utilize medicinal plant around them. The village folk have their own diverse systems of health management known as Local Health Tradition (LHT). This vast section of the population of the folk practitioners including tribals are using about 5,000 - 8,000 species of plants for medicinal purpose. There is however no systematic inventory/documentation about the folk remedies of India. Such enormous use of medicinal wealth is rather unique in the world.

Regarding medicinal properties, it has been postulated in Ayurveda that “there is no substance (including plants) in the universe which can not be used as drug when used rationally and with definite objective.” (CS {*Sutra sthan* 12), Ashtang Sangrah (*Sutra sthan* 17), Ashtanga Hridaya (*Su. sthan* 9). It is needless to say that the medicinal plant or “Dravya” is one of the most important pillars or components, out of the four pillars (Chatushpad) recognized in Ayurveda, required for ‘Chikitsa’/treatment (Ashtanga Hridaya *Su. sthan* 1/27).

Medicinal plants as part of culture

The ancient Indigenous systems of Medicines particularly Ayurveda, Unani and Siddha and also the LHT in rural and Tribal areas are based on herbal drugs for treatment and health care. In the villages elderly people have knowledge they prepare medicine from local herbs based on their experience. As such the medicinal plants/herbs have become a part of our culture. It is evident that the Indian people have tremendous passion for medicinal plants and use them for wide range of health related problems from common cold, memory improvement and treatment of poisonous snake bite to care for muscular dystrophy and enhancement of general immunity etc. In the oral traditions local communities in India has one of the richest plant medical culture in the world. This unique culture of health management not only provide health security to millions of people but it can also provide new and safe herbal drugs to entire world. There are estimated to be around 25,000 effective plant based formulations used in folk medicine by the rural communities of the country, besides around 10,000 designed formulations available in indigenous medical texts. (Anony, 2000).

Source/Distribution of medicinal plants

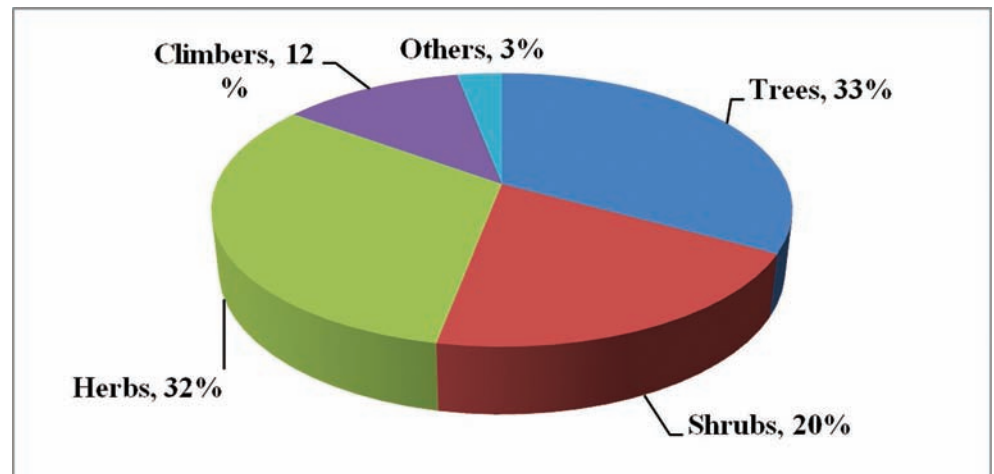
The rich flora and fauna of the country harbouring medicinal plants is about 7% of the world biodiversity. It has 16 major forest types distributed in varied bioedaphic and agro-climatic conditions from alpine to temperate Himalayas, subtropical forest, desert, scrubs and mangroves along the coast. The recorded forest area (76.5 million ha.) is 23.3% of the total geographical area of the country. However, the actual forest cover is 66.34 million ha. out of which 31.85 million ha. is degraded. The vegetation / forest cover, besides, other habitats constitute the Source of various wild medicinal plants in the country. The other main source is from cultivation and other *ex situ* means.

Nearly 8000 species of medicinal plants distributed in 386 families and 2200 genera of flowering plants are the main source of Raw drugs. Macro-analysis

of distribution of medicinal plants show that they are distributed in various diverse habitats. Around 70% of the medicinal plant are found in tropical areas particularly in dry and moist deciduous forest areas in different geographical regions of the country including the Himalayas, Western/Eastern ghats, Vindhyas, Aravallies, Chotta Nagpur plateau etc. Around 30% medicinal plants are found in higher altitudes including the temperate and alpine areas, however, they include species of high medicinal value.

An analysis of habits of medicinal plants given below indicate, that the majority of them are higher flowering plants comprising of 33% trees followed by herbs, shrubs, climbers etc. A small percentage of about 3% medicinal plants are from lower group of plants like Ferns, Algae, Fungii.

Distribution of Medicinal Plants by Habits



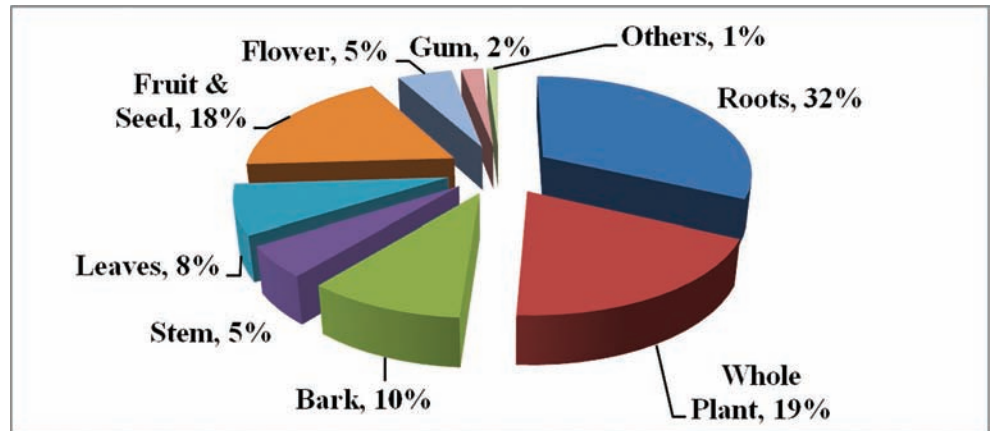
Source : Report of Task Force (GOI, 2000)

Raw drugs

The various parts of medicinal plants used for preparation of medicines are the Raw-drugs or Crude drugs. These along with the phytochemicals forms the basic material used in the pharmaceutical industry in the medicinal plants sector. Raw drugs required for the production of various formulations are usually dried parts of medicinal plants such as root, stem, wood, bark, leaves, flowers, seed, fruits, whole plants etc. They infact constitute the starting material for the formulations of ISM&H (Ayurveda, Siddha, Unani etc.), Tibetan and other systems of medicine including the folk/ ethnomedicines. The crude drugs are also used to obtain therapeutically active chemical constituents by specialized methods of extraction, isolation, purification etc. and are used as phytochemicals for production of modern allopathic medicines or phyto-medicines. The unsustainable and extensive use of raw drugs particularly the

root, whole plant and fruit/ seeds has resulted in depletion of medicinal plants. The break-up of usage of various parts of raw drugs is given below :

Break-Up of Usage of Medicinal Plants by Parts



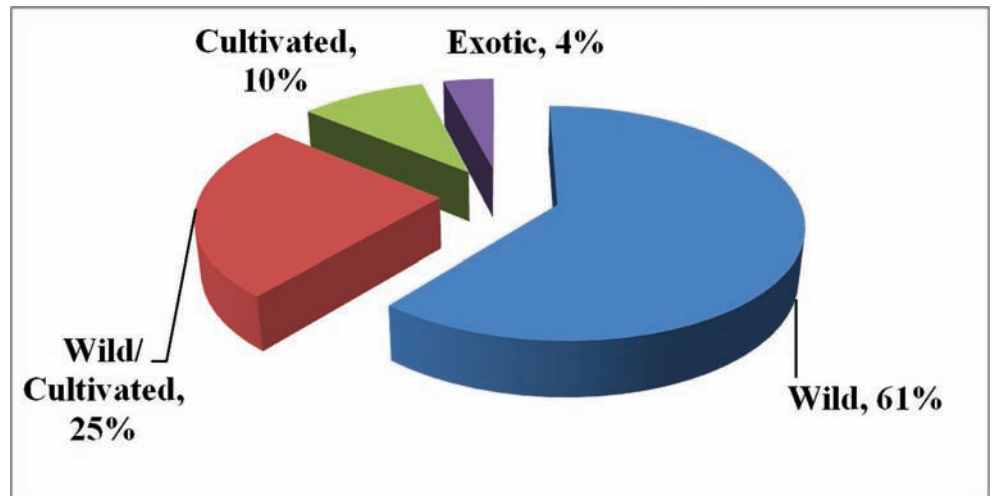
Source : FRLHT, Trade Database, 2003

It appears from above data that the bulk of plant material is obtained from the roots, whole plant, fruits/seeds and bark, which are vital for the survival and regeneration of medicinal plants in nature. Their unsustainable and destructive harvesting has brought about depletion and scarcity of medicinal plants.

Medicinal plants resource and collection

The rich biodiversity (narrated earlier) distributed in the forests and other areas all over the Country is the wild resource base (nearly 61%). Medicinal plant wealth is living repairable resource, exhaustible if over used and sustainable if used with care and wisdom. Owing to harvesting of nearly 95% collection of medicinal plants from wild in unsustainable way, there has been a depletion in the resource base. It has also been confirmed through many studies that pharmaceutical companies are also responsible for inefficient, imperfect, informal and opportunistic marketing of medicinal plant. As a result the raw material supply situation is shaky, unsustainable and exploitative. There is also problem in the availability of genuine medicinal plants and due to this problem the use of substitutes in place of genuine resource base started. As a result practice of adulteration is becoming common. The true source of crude drugs in such cases can only be detected after chemical/ pharmacological analysis. The medicinal plants are obtained from the wild, wild & cultivated, cultivated and exotic sources. In the diagram below percentage-wise sources of medicinal plants used in trade is given:

Source of Medicinal Plants Traded in India



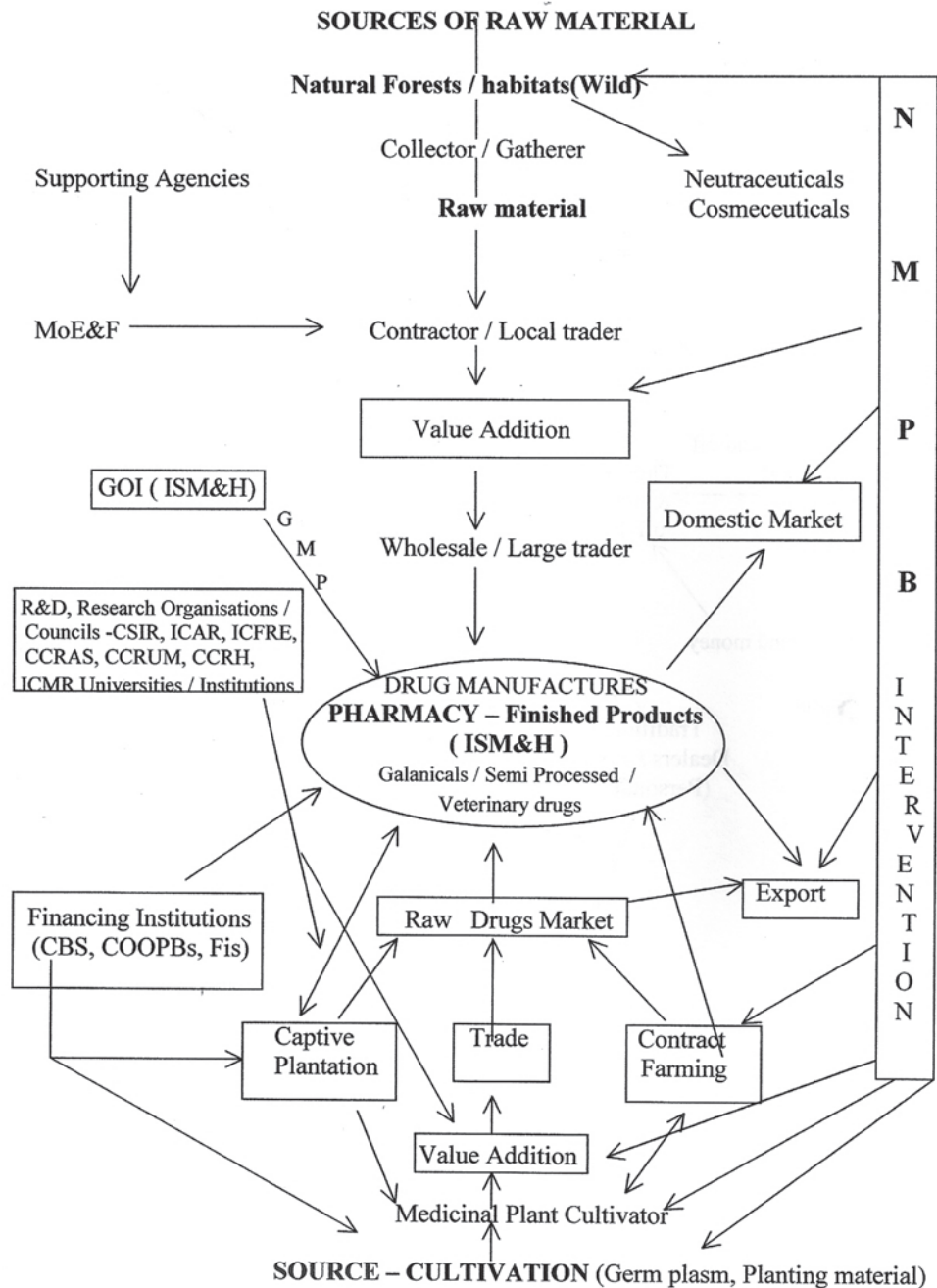
Source : FRLHT, Trade Database, 2003

The quality of resource material of medicinal plants depends on geographical origin, time and stage of the growth of the plant at the time of collection and post harvesting handling. The collection in most of the cases is done unsustainably by unskilled villagers/tribals etc. without paying any attention with regards to their identity, maturity, season of collection, proper drying, storage etc. The quality of the collected material in such cases is often degraded. Collection of non-timber forest produce (NTFP), which includes medicinal plants, is a way of life with the tribal and rural communities in and around the forest. In rural and tribal areas NGOs and GOs have encouraged to form co-operatives for collection of raw drugs. The prices paid to the gatherers/collectors tend to be very low they often extensively collect the natural resources indiscriminately, unsustainably with a view to generate maximum income. Several medicinal plants have been assessed endangered, vulnerable/rare due to unskillful over harvesting from the wild source. Habitat destruction in the form of deforestation is an added danger, due to such over exploitation.

The other main source of medicinal plant is from cultivation. Cultivated material though costly is definitely preferred in production of medicine since the quality of the crude and processed drug is maintained. Because of the higher cost of cultivated material contractual cultivation is preferred. Recently the growers have set up co-operatives for cultivation of medicinal plants. Of late, organic farming is gaining wide acceptance due to demand particularly in developed countries for organically grown crops.

Trade

Trading of medicinal plants is complex and unorganized. The trade in wild medicinal plants at various levels is vast, secretive and mostly unregulated in working. It continues to grow in absence of serious policy/ regulation in environmental planning. The crude drugs trade is based on local names as



the supply chain starts from unskilled, illiterate collector to the contractor/ local trader to the larger trader/wholesaler or the manufacturers. The raw material is procured by the pharmacy from the drug dealers in the regional market of the cities like Mumbai, Delhi, Kolkatta, Chennai, Hyderabad, Amritsar, Patna, besides many small cities of the country. The drug dealers of small cities procure the material from the so called 'unknown sources' (being a secret trade). 90% of the material ultimately come from the various parts of the forests in the country, collected by unskilled forest dwelling communities and purchased by the contractors at nominal price. These supply chain often extends to be 3-4 tiers without much value addition but with increasing sale price (70 - 100%) at each level up to the pharmacy. Many times the same crude drug is available in various grades with major traders having considerable difference in price, for example various grades of 'Safed Musali' are available at varying prices of Rs. 800 - 1200 per kg depending on the source of origin and other factors.

Crude drug trades in certain states like Kerala, Andhra Pradesh, Maharashtra, M.P., Rajasthan etc. operates through Tribal Co-operative Societies established to ensure fair price for tribals who collect the crude drugs. However, operation of many of these organizations is unsatisfactory, hence tribal prefers to sale their produce to middlemen for getting quick payment in cash. Most of the pharmacies of ISM have long standing relationship with large traders through generations often at personal level. The users satisfaction level is quite high. The pharmacy prefers crude drugs originating from a specific geographical region. Thus pharmacy also becomes the ultimate part of the supply chain.(see diagram-med. plants sector at a glance)

Traditional to modern technology (value addition)

The medicine for internal use prepared in traditional manner involve simple methods such as hot / cold water decoction (extraction), juice, powder, pastes administered through vehicle such as water, oil, honey etc. The traditional medicines are prepared using age old methods usually by the practitioners himself after correctly identifying the plant. This practice of self dispensing is gradually shifted to profit oriented herbal drug stores. There is no guarantee of the authenticity and quantity of plant material used in such preparations. Thus traditional methods have many disadvantages, which could be modified and corrected by selecting suitable technologies to make them more effective, stable and in requisite dosage forms etc., which can be easily transported. Use of sophisticated modern technology for the production of quality drugs is necessary to maintain the quality standards at national and international levels.

The value of medicinal plant for fetching foreign exchange from developing countries depends on the use of authentic value added plants as raw materials in pharmaceutical industries. These raw materials are used to: 1. Isolate pure active compounds for formulation in to drugs, 2. Isolate intermediates for production of semi synthetic drugs, 3. Prepare standardized galenicals (extracts, powders, tinctures etc.).

Quality assurance and standard preparations

The production of traditional medicine for local use does not require stringent standards. The control of quality of raw materials, processes and finished products is an absolute necessity, if it is required for world market and human consumption. International standards specifications exist for some processed products and some countries and buyers have their own requirements. The quality requirement for medicinal plant preparations are stringent in terms of content of active principles and toxic materials. There is need to develop modern technology to ascertain that the medicinal plants used are non-toxic. Standard preparations of Traditional drugs are required to be developed for their quality, efficacy and potency.

Quality has to be built into steps as management systems, the whole process is strictly controlled beginning from the selection of propagation material to the final product reaching the consumer. All elements of the Total Quality Management (TQM) have to be introduced in any industrial project. The requirements for ISO 9000 certification and GMP norms have to be introduced and followed. The personnel are trained so that enterprises could introduce the proper systems needed for certification. ISO 14000 leading to Eco-labeling through eco-audit procedures will also be required for safeguarding and environmental damage.

Property rights

Medicinal plant represents not only available part of India's biodiversity but also source of great traditional knowledge. In the past, the knowledge widely transmitted even to neighboring countries was regulated by an ethical code of conduct which is a part of tradition of teaching called '*Guru Shishya parampara*'. This teaching tradition was provided open access of the knowledge to 'worthi seekers', it was never viewed as commodity to be bought and sold. However, in the modern times, the idea of "private intellectual property" has been given a legal status and trade in intellectual property is a part of current day commerce. Thus India is forced to put market value to

traditional knowledge and regulate its access to commercial users based on International norms. There has also been problem of bio-piracy, which refers to the theft of traditional knowledge, and its appropriation through filing of false 'patent claim' for rights of ownership. A need for 'protection and promotion of traditional knowledge' was therefore felt. The major problem confronting India is how to apply patent law for formulations and products which have been developed over thousands of years ago.

The department of ISM & H, Govt, of India has initiated a national project called 'traditional knowledge digital library (TKDL)', with a view to prevent bio-piracy. The primary objective of TKDL is to prevent a grant of (false) patent on the traditional knowledge of the country. Currently TKDL focuses on the codified traditional medical knowledge systems. It also plan to use it for documenting orally transmitted local health traditional practices in the country.

Marketing

According to CHEMEXCIL, National Pharmaceutical market is of the order of Rs. 12500 cr. inclusive of Ayurvedic market, which is of Rs. 2500 crore. Out of this Rs. 2000 crore is of OTC range and only Rs. 500 crore is of ethical range. The rate of growth of the market is approx. 20% per year. However, in absence of any systematic survey no authentic data of Ayurvedic market is available.

Marketing is a complex problem affecting the development of plant based industry of medicinal plant sector in developing countries. Marketability will be a crucial factor in determining the failure or the success of these industries. The market out lets can be for domestic (local) use and for export. Some of the products for local use reach the consumer directly while others have to be further processed or used as secondary components in other industrial products. Hence user industry have to be promoted so that locally produced extracts can be used to save foreign exchange needed for import of such additives. Further, the processing to yield value aided products will have to be produced at prices to be competitive in the world market. Market promotion is crucial to penetrate the world market. A holistic management action plan is essential to formulate management of the resource based harvesting, processing, trade, marketing etc.

Global Scenario (Alternate Medicine Market)

With the advent of recent herbal revolution, consumption of plant based products in phyto-medicine has increased considerably throughout the world. The various traditional medical systems including Ayurveda, Siddha, Unani

etc. under the ISM & H have been internationally recognized under Alternate systems of medicine. China and India are the two great producers of medicinal plants having more than 40% of global biodiversity. China earns US\$ 5 billion per year from herbal trade. According to an estimate (TAS-ITC) India ranks 3rd after China and USA among the leading exporters of medicinal plant of the world. Thus, there is enormous scope for India also to emerge as major player in global herbal products based medicine.

According to the Report prepared by Mc Alpine Thorpe and Warriar Limited, U.K., for Common Wealth Secretariat in 1997, the global herbal market is estimated to be Rs.51, 000 crores. Out of this, Indian export is only Rs. 280 crores, which is 0.5% of total export market while share of China exports of total market is 35.3%. Present estimate is that China exports Rs. 22,000 crores while India's export is only Rs. 480 crores. According to the WHO, the global market for medicinal herbs and herbal products is estimated to touch by the yr. 2050 US\$ 5 trillion. Percentage of population using Traditional Medicine at least once in different countries is as under:

Australia 48%, Canada 50%, USA 42%, Belgium 40%, France 75%, UK 90%. 46 % of Swiss doctors use complementary alternative medicine mainly Homeopathy and Acupuncture. 40% of General practitioners in UK offer access to complementary or alternative medicine. In USA the use of traditional medicine by doctors increased from 34 % in 1990 to 42 % in 1997.

In Africa more than 80% of the population uses traditional medicine. In several African countries more than 60% of children with high fever are treated at home with traditional medicines. They are interested in low cost option based on Indian medicine. In Japan 60 - 70% of Medical doctors prescribe Kompon medicine. In Malaysia, Chinese and Indian medicine is extensively used. In China, traditional medicine accounts for more than 40% of the drugs provided by the healthcare system. 71 % of population in Chile and 40% of population in Columbia accepts traditional and complementary medicine.

Govt. Initiatives for Conservation & Development

Programs of Ministry of Environment and Forests (MoEF)

A Centrally Sponsored Scheme for the Development of National Parks and Sanctuaries has been under operation through the MoEF since the Sixth Five Year Plan. The main objective of the scheme is to support protection and conservation measures in the National Parks and Sanctuaries. The Eighth Five Year Plan and the outlay for the Ninth Plan is Rs. 110.00 crores. Under the

National Afforestation and Eco-development Board (NAEB), documentation of the Sacred Groves have been carried out by the Regional centers. The NAEB is also implementing a Centrally sponsored Scheme of Minor Forest Produce since the year 1988-1989 with 100% central assistance to the States covering various activities including cultivation of medicinal plants like *Rauwolfia* spp., *Dioscorea* spp. and of rosha grass/ lemon grass to augment the rising demand and to offset the scarcity because of unscientific exploitation. During the Ninth Five Year Plan the scheme has been extended to 25 States with an outlay of Rs.80.50 crores.

Ban on exports of medicinal Plants

The habitat loss by export of medicinal plants collected from wild sources may lead to severe and irreplaceable loss of genetic stock of many of these species. The Ministry of Environment and Forests has, therefore, notified 29 species, Which are banned (wild source) for export from India.

Externally aided projects

The Foundation for Revitalization of Local Health Traditions (FRLHT), Bangalore has been implementing a UNDP Country Cooperation Program -assisted Sub-programme on "Medicinal Plants Conservation and Sustainable Utilization" since December, 1999. This is basically a demonstration project aimed at replicating the activities being carried out in the States of Andhra Pradesh, Karnataka, Kerala, Maharashtra and Tamil Nadu. The activities include survey and inventorisation of medicinal plants in the selected areas and Identification of the sites for *in-situ* conservation. The United Nations Development Programme (UNDP) operates the Small Grants Programme (SGP) on behalf of Global Environmental Facility (GEF). Under this programme there are 11 projects on medicinal plants covering the States of Assam, Gujarat, Himachal Pradesh, Kerala, Meghalaya, Rajasthan and Uttar Pradesh. These projects are being executed by NGOs at the grass root level.

Programmes of Department of Ayurveda, Yoga, Unani, Siddha and Homoeopathy (DoAYUSH)

The DoAYUSH (formerly DoISM&H) started a Central Sector Scheme on Development and Cultivation of Medicinal Plants in the year 1990-1991 with the objective of developing medicinal plants gardens and agro-techniques for important species of medicinal plants through the Government and Semi-Government organizations. The medicinal plants garden set up under the

scheme are to serve as demonstration centers for those intending to take up this activity commercially and also to create awareness about medicinal plants. In an another Central Scheme for Development of Agro Techniques and Cultivation of Medicinal Plants Used in Ayurveda, Siddha, Unani and Homoeopathy with effect from the year 1997-1998, central assistance is provided to specialized scientific institutions (Govt./Semi-Govt.) on project basis (3 years duration) for development of agro-techniques for about 126 medicinal plants.

Task Force on Medicinal Plants (Planning Commission)

The planning Commission constituted a Task Force in June, 1999 under the Chairmanship of Dr. D.N. Tiwari, Member Planning Commission to provide policy directives, identify measures for sustaining the resource base, evolve suitable marketing strategy besides facilitating protection of patent rights and intellectual property rights on these plants.

Some of the important action programmes suggested by the Task Force on Conservation and Sustainable Use of Medicinal Plants are as follows :-

1. To establish 200 Medicinal Plants Conservation Areas (MPCA).in the country.
2. About 100 medicinal plants classified as endangered or rare or threatened should be grown in well-established gardens of the country.
3. Three gene banks created at CIMAP, Lucknow, NBPGR, New Delhi and TBGRI, Trivandrum.
4. Attempt should be made to establish 200 "Vanasapti Van" in forest areas for commercial supply of crude drugs.
5. Forest Departments should effectively regulate extraction and transport of medicinal plants from wild.
6. About 50 NGOs (including agricultural universities) technically qualified may be identified for improving awareness, availability of seeds and planting material of medicinal plants for people interested in their cultivation.
7. Twenty five species, which are in great demand, may be encouraged for cultivation. Contract and organic farming should be encouraged.
8. Quality and pharmaceutical standards of herbal drugs should be finalized.

9. A "National Medicinal Plants Board" should be established.
10. All efforts to be coordinated to ensure export of herbal products to earn Rs. 3000 crores by 2005.

Report of SAC to Cabinet

The Scientific Advisory Committee to the Cabinet (SAC-C) Govt. of India conducted a study entitled "Herbal Products- current status, vision and action Plan", supported by Technology Information, Forecasting and Assessment Council (TIFAC), New Delhi (2001). The committee suggested 45 plants for over all development of the sector on priority. They recommended and short-listed 7 potentially important medicinal plants for the next five year (2001-2005) for more concentrated focused attention.

Programmes of Department of Agriculture and Cooperation

The Department of Agriculture and Cooperation, Ministry of Agriculture launched a Central Sector Scheme on Development of Medicinal and Aromatic Plants during the Eighth Five Year Plan with an outlay of Rs.5.00 crores. Programmes for development of quality planting material, establishment of herbal gardens, establishment of regional analytical laboratories were taken up.

Significant achievements of the schemes are

- 53 hectares were covered under herbal gardens.
- 14 nurseries for medicinal plants were established.
- 164 hectares developed for production of quality planting material of aromatic plants.
- 5 Regional analytical laboratories were established.
- 936 demonstration plots were laid.

Programmes of Department of Family Welfare

Under Reproductive Child Health Care Programme of the department, two schemes viz. creation of 'Vanaspati Van' and Medicinal Plants Nursery for creating awareness are functioning with the collaboration of Deptt. of ISM & H. So far 9 Vanaspati Vans have been constituted.

Projects of Deptt. of Biotechnology (DBT)

A number of projects on medicinal plants have been undertaken by the Deptt of Biotechnology on various aspects. The project on “Inventorising the Medicinal Plants Resources of India” coordinated by NBRI (2001) is worth mentioning.

Medicinal Plants Board

The Department of AYUSH has constituted a Medicinal Plant Board in the year November 2000. It is functioning under the Chairmanship of Union Minister for Health & Family Welfare with representatives from concerned Ministries/ Departments. The objectives of setting up of the National Medicinal Plants Board (NMPB) is to create a body, which shall be responsible to look after matters on all related aspects of medicinal plants sector as a whole. With a view to develop, conserve and promote various activities the National board has identified and prioritized 93 medicinal plants for the development of the sector. Depending upon their scanty availability in nature and subsidy these plants are grouped in to 3 categories, i.e. 45 plants with 20% subsidy, 32 plants with 50% subsidy and 16 plants with 75% subsidy.

Schemes

The NMPB has been implementing following schemes for the overall development of the Medicinal Plants sector in the country:

1. Central Sector Scheme of Conservation Development and sustainable Management of Medicinal Plants.

It focuses on the promotional activities like resource documentation, *in-situ* conservation of rare and Endangered species. Support to Joint Forest Management Committee (JFMC) for value addition , capacity building and Training etc.

2. The centrally sponsored scheme of “National Mission on Medicinal Plants”. The mission located in NMPB DoAYUSH and will have 2-tier structure – National and State.
 - a) The Mission supports over all cultivation, activities in all respects and to promote standardization and QA of AYUSH products.
 - b) Support setting up Processing zones/ Clusters covering relevant activities.

- c) Adopt Mission mode approach and promote partnership among stake holders involved in R & D, processing and marketing in public/ private sectors at National, Regional, State and sub-state levels.

The schemes will cover the following areas of Medical Plants sector in general:

Survey and inventorization of medicinal plants; *In-situ* conservation and ex-situ cultivation of medicinal plants; Production of quality planting material; Extension activities - Information, Education and Communication(IEC); Study, demand, supply, position and marketing of medicinal plants for domestic and global market; Import/Export, IPR-issues; Research and Development in medicinal plants sector; Strengthening capabilities of NMPB. (For details visit-www.nmpb.@nic.in)

Important Issues And Problems

Conservation and Cultivation

The World conservation strategy (IUCN, UNEP & WWF, 1980) defines conservations as “the management of human use of the biodiversity so that it may yield the greatest sustainable benefit to present generation while maintaining its potential to meet the needs and aspirations of future generations”. The above definition invokes two complementary components “**Conservation**” and “**Sustainability**”. Conservation is one of the important areas of medicinal plants sector. Conservation of medicinal plants, particularly the threatened species, is therefore considered to be the most important responsibilities of all biodiversity rich nations. Medicinal plants are potential renewable natural resources. Therefore, conservation and sustainable utilization of medicinal plants must necessarily involve long term, integrated, scientifically orientated action programme. A holistic and systematic approach envisaging interaction between social economic and ecological systems will be a more desirable one. The most widely accepted scientific technologies of biodiversity conservation are *in situ* and *ex situ* methods.

Threat status

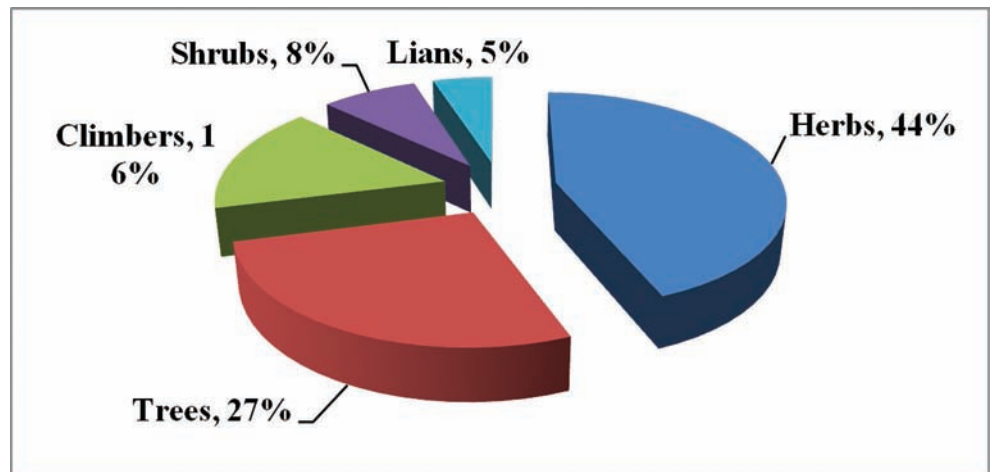
It is understood that the medicinal plants are threatened continuously due to over exploitation. There is no data available on the threat status and extent of threat of . medicinal plants. However, an assessment of selected species of medicinal plants of peninsular India and north India, covering states of Kerala, Karnataka, Tamil Nadu, Andhra Pradesh, Maharashtra, Himachal Pradesh and Jammu & Kashmir, for their threat status based on Categories

of IUCN (now World Conservation Union), revealed that there are 100 traded species (from wild sources) that are under various degrees of threat, study conducted by FRLHT (Trade Database - 2003). Fourteen species have been identified to be threatened globally as these are endemic to India and deserve higher conservation priority. On the regional scale (in different states - Andhra Pradesh, Jammu & Kashmir, Himachal Pradesh, Kerala, Karnataka, Maharashtra, Tamil Nadu), threat status analysis revealed that 16 were recorded to be Critically Endangered (CR), 30 Endangered (EN) and 39 Vulnerable (VU). Habit wise break up of threat status of threatened species is given below:

In situ conservation

In situ conservation means-conservation of plants in their natural habitats - this include setting up of Biosphere reserves, Sanctuaries (1,15,903 Sq. km. area) and National parks (34,819 Sq. Km. area). The Ministry of Environment & Forests, Govt, of India has established eight biosphere reserves (out of 14 sites identified), 85 national parks and 448 sanctuaries are under the Wild life protection Act of 1972.

Threat status of Traded Medicinal Plants – Habit wise



Source : FRLHT, Trade Database, 2003

One of the systematic and pioneering conservation efforts in the country has been initiated in 1993, only in one out of the ten biogeographic regions of the country. The programme was initiated in the three Southern states (Kerala, Tamil Nadu and Karnataka) and a comprehensive programme for establishing a **network** of 33 *in situ* forest reserves each one around 200 ha. size, covering different vegetation types, for conserving the medicinal plant biodiversity of the

region. The mega conservation strategy underlying this program is simple, yet elegant based on the fact that forest are natural gene banks. It is also most cost effective way of conserving the inter and intra specific diversity. Since 1998, this program has been extended to Andhra Pradesh and Maharashtra adding 21 more medicinal plant forest reserves to the network, thus a network of 54 forest reserves have been established. The State governments of the five peninsular states have decided to provide a separate chapter on the conservation and sustainable use of medicinal plants in their respective working plan of the State. They have also established 54 forest gene banks along with a chain of decentralized medicinal plants nurseries networking. The effectiveness and results of such conservation are yet to come and needs to be observed for further modification and adoption in other states.

Ex situ conservation

Ex situ means conservation outside natural habitats by cultivating and maintaining plants in botanical garden/parks and other suitable sites, besides through long term preservation of plant propagules in gene banks (seed/pollen banks, DNA libraries etc.) and in plant tissue culture repositories by cryo-preservations. Of these cultivation is one of the important means of *ex situ* conservation. India has a network of about 140 botanical gardens including 33 gardens in the Universities and also the garden / herbal farms developed by the research councils (CSIR, ICAR, CCRAS etc.). But only few University botanical gardens have active programs on conservation, however, conservation of the endangered species *Commiphora wightii* at Guggulu herbal farm at Mangliawas (Ajmer) under CCRAS (Now under National Institute of Ayurveda, Jaipur) is worth mentioning. Herbal gardens are an important component of *Ex situ* conservation, they infact represent the species diversity and regional medicinal flora of a particular region. Herbal Gardens have also been jointly established by the State forest Deptt. and Ayurveda Deptt. in several States like Gujarat, Karnataka, H.P. etc. It has multifold advantages besides conservation. Tropical Botanical Garden and Research Institute (TBGRI), Trivandrum under Field Gene Bank program (1992-1999) has set an excellent example of *ex situ* conservation of medicinal and aromatic plants diversity. This program is essentially a blend of *ex situ* and *in situ* situations.

Biology offers a whole range of techniques for germ plasm conservation, particularly to the recalcitrant seeds or species that do not set seeds, through *in vitro* banks. Department of Biotechnology (DBT) under G-15 countries program of Govt, of India has established three National Gene banks for Medicinal and Aromatic plants at Central Institute of Medicinal & Aromatics

Plants, Lucknow, National Bureau of Plants Genetic Resources, Delhi and Tropical Botanical Garden & Research Institute, Trivandrum. These essentially take care of the different *ex-situ* methods of conservation of medicinal plants of India including cryo-preservation of medicinal species. DBT has also launched a program on molecular taxonomy of selected endemic and important medicinal plants of India.

Cultivation

There has been an enormous increase in the popularity of alternate medicine and herbal products all over the world; as such the demand is increasing day by day. During last decade number of Govt, organizations - institutions and schemes of ICAR, CSIRj NBPGR, Agriculture Universities and Deptt. of ISM, Family welfare, Deptt. of Agriculture Co-op., Forest Deptt. Govt, and some of NGO's have initiated development of Agro-techniques and cultivation of medicinal and Aromatic plants. Looking to the demand of vast medicinal plant sector, present efforts of cultivation of medicinal plant in the country is quite insufficient. The area of medicinal plants cultivation is estimated to be around 111000 ha. (FRLHT - Trade database,2003), which is 25% of the size of progress in China. In China the acreage under medicinal plant cultivation was reported around 450000 ha. In India 61% of medicinal plant in trade are still harvested from the wild and only 34% are only partially cultivated. Cultivation; program in India is not sufficiently supported with good agricultural practices like organic cultivation, sustainable harvest, period of harvesting, season of collection etc. besides suitable habitat, agro-techniques.

A review on the status of scientific information on the propagation and the agro-technology for 880 traded species (FRLHT - Trade Database, 2003) indicated that propagation methods for only 313 species are known and information on agro-techniques along with economics is known only for 108 species. This available information needs more detailed site specific and multi central trials besides other data required for the purpose. An analysis for sources of procurement of the 880 traded medicinal plants revealed that 538 of this species occur only in the wild with no known cultivation (FRLHT - Trade Database, 2003), where as 88 species are procured only from cultivation as no wild population exist 212 species are procured both from the wild as well as cultivation and 42 of this believed to be imported from other Countries. Among 48 exported species, out of 880 traded species, 5 are purely cultivated, 14 harvested from the wild and 24 species are found both in wild and cultivated sources and the remaining are exotic which are imported, semi processed and

exported. Most of the produce of cultivated medicinal and aromatic plants is exported as crude drugs. The details of cultivation are given below:

Psyllium (*Plantago ovata*) in 50,000 ha. Northern Gujarat, Western Rajasthan
Senna leaves (*Cassia senna*) in 10,000 ha. Rajasthan, Tamiil Nadu
Opium (*Papaver somniferum*) in 18,000 ha. M. P., Rajasthan, U. P.,
Asgandh (*Withania somnifera*) in 4,000 ha. M.P. (Neemuch-Ratlam belt)
Saffron (*Crocus sativus*) in 3,000 ha. Kashmir (Pampore & Bhadarwah),

Apart from these species *Chrysanthemum cinerariifolium*, *Foeniculum vulgare* and *Lawsonia inermis* are also cultivated and exported.

In the recent past cultivation of Safed Musali, Brahmi and few other species have also been extensively taken up mostly by the NGO's and farmers. There are no reliable data available, based on field studies about the total area and extent of commercial cultivation of medicinal plant.

Recognizing the trend many larger pharmacies like Dabur, Zandu, Himalaya drugs, AVS, Kottakal, Shree Dhootpapeshwar etc. have started promoting contract farming of medicinal plants to meet their demand. The modern pharmaceutical industries like Cipla, Natural remedies, Core Health Care, Cadila Health Care, Bio-Med Pharma etc. who specialize in production of a few speciality drugs/chemicals from plant sources are also involved in contractual cultivation to supplement their requirements. They enter into *buy-back* arrangements with the growers and employ modern product standardization techniques. Established traders of crude drugs also feel that promotion of cultivation of medicinal plants is a step in right direction. (Annonay. 2000).

Factors affecting cultivation

Cultivation of medicinal plants is profitable for some of the species like Safed Musali, Senna etc. but in most of the cases it is not cost effective. This is mainly because of the fact that the cost of production and sale price of cultivated plants is higher than that of wild produce. The farmers therefore are at loss. Some of the factors affecting cultivation are briefly given hereunder:

1. Lack of price parity with wild produce.
2. Lack of information on Agro-techniques, post harvest techniques and economics on cultivation.
3. Lack of quality planting material/elite Germ plasm.
4. Differences in properties of produce from wild and cultivated sources.

5. Lack of good Agricultural practices and organic farming.
6. Lack of information on market prices/Linkages.
7. Lack of support from financial Institutions

Domestic Users & Raw Material Requirements

The manufacturing sector consumes the highest volume of medicinal plants, apart from the practitioners and other users of ISM&H. The over all domestic turnover of the 8,000 licensed pharmacies in the manufacturing sector is estimated around Rs.4,200 crore per annum while the export turnover for the finished herbal products was estimated to be around Rs.239 crore per annum (2001-2002) while it was around Rs.634 crore in respect to export of crude drugs and plant extracts. There is also a large segment of non commercial users generally based on regional ecosystems. There is, However, no reliable data available on the extent of consumption of specific raw materials. The estimation of actual or even fairly estimated demand of raw material is a difficult task because the basic data on source, consumption and the demand per annum of the raw drugs is usually not provided by the traders and manufacturers. If at all it is provided, it is far from realistic.

In order to assess the raw material requirement of medicinal plants by domestic commercial users three sources can be referred namely: a) Report "Demand study for selected Medicinal Plants" prepared by Center for Research, Planning and Action (CERPA), New Delhi, (2001-2002) commissioned by Govt, of India (GOT), DoISM&H, with a view to generate baseline information, b) Report of the Task force "On conservation & sustainable use of Medicinal Plants" commissioned by Planning Commission, GOI (2001). c) Interpolations carried out by foundation for Revitalization of Local Health Traditions (FRLHT) based on the annual turnover of herbal industry.

The data on domestic use of medicinal plants is given below:

Estimated Demand for Medicinal Plants

| Source - Particular | Basis of Study (No. of Plants & year) | Domestic Demand (in tonnes) | Value (Rs. crore) |
|---|---------------------------------------|-----------------------------|-------------------|
| a) Study Commissioned by DoISM&H, GOI, Report "Demand study for selected Medicinal Plants" prepared by CERPA, New Delhi (2001-2002) | Total 1200 Plants (1999-2000) | 198054-71 | 1099.18 |

| Source - Particular | Basis of Study (No. of Plants & year) | Domestic Demand (in tonnes) | Value (Rs. crore) |
|--|--|-----------------------------|---------------------------------|
| | Plants not included in the study (1999-2000) | 7723741 | 428.68 |
| | 162 Plants Studied (1999-2000) | 120816.80- | 670.50 |
| b) Task Force on Conservation and Sustainable Use of Medicinal Plants-Planning Commission, GOI, March 2000 | | 2,40,000 | Not given |
| c) Estimates prepared by FRLHT (based on National Draft Policy on ISM, 2001 and DGCIS data | Plant raw material for domestic/ industrial consumption + Exports excluding extracts | 1,28,000 | 384 + 463 384 + 463 - Total 847 |

Source: Compiled from above sources.

Projected Data

| Source - Particular DoISM&H - Demand study report (CERPA), GOI (2001 - 2002) | Domestic Demand (in tonnes) | Value, (Rs. crore) | Annual Rate of Growth |
|--|-----------------------------|--------------------|-----------------------|
| Demand of 162 Plants under study (1999-2000) | 120816.80 | 670.50 | ' |
| Demand of 162 Plants under study (2001-2002) | 160541.6 | 88560.4 | 15.1% * |
| Demand of 162 Plants under study (2004-2005) | 272617.8 | 145328.1 | 16.70% |

The data given by each source agency provide different estimates and can not be reconciled. The CERPA and Task force report are based on very small number of pharmacies and species of plants. However, FRLHT basis though partially realistic needs further substantiation.

Domestic User's Profile

Manufacturing Units

The major users of the medicinal plants are the manufacturing units and the practitioners. The exact data regarding number of licensed pharmacies and their structural break up in terms of large medium and small companies are not available at single place since it is available in the respective states. The information gathered through secondary sources is given in following the table:

| Sr. No. | Source | User Category | Numbers |
|---------|--|-----------------------------------|----------|
| 1 | CERPA Report and ISM Policy of GOI, 2002 | Manufacturing Units | 8343 |
| 2 | CERPA Report and ISM Policy of GOI, 2002 | Codified practitioners (licensed) | 5,00,000 |
| 3 | LSPSS Reports | Folk Practitioners | 1,00,000 |

Source: Reports cited above

The number 8343 of ISM manufacturing units is dominated by Ayurveda (7149) manufacturing units followed by Homeopathy (615), Siddha (309) and Unani (270). According to an estimate there are 6965 small/ very small manufacturing units (turnover Rs. 1-5 crore); 25 under the category of medium manufacturing units (turnover Rs. 5-50 crore) and 10 large pharmacies with over Rs. 50 crore turnover. The state wise distribution of registered manufacturing units in the following table indicate that large proportion of units are located in U.P. followed by Tamil Nadu, Kerala, Gujarat and Maharashtra.

State-wise Distribution of Registered Manufacturing Units in India

| Name of State | Mfg. Units | Number of Large Units |
|----------------|------------|-----------------------|
| Uttar Pradesh | 2133 | 38 |
| Andhra Pradesh | 785 | 18 |
| Tamil Nadu | 710 | 10 |
| Kerala | 670 | 34 |
| Gujarat | 623 | 22 |
| West Bengal | 603 | 15 |
| Maharashtra | 515 | 26 |
| Rajasthan | 447 | 6 |
| Madhya Pradesh | 406 | 14 |
| Bihar | 344 | 12 |
| Haryana | 272 | 2 |

| | | |
|--------------------|-----|----|
| Karnataka | 235 | 4 |
| Orissa | 196 | 3 |
| Delhi | 118 | 10 |
| Punjab | 117 | 3 |
| Himachal Pradesh | 65 | 8 |
| Assam | 47 | 4 |
| Daman & Diu | 21 | 0 |
| Dadra Nagar Haveli | 13 | 4 |
| Goa | 7 | 0 |
| Jammu & Kashmir | 7 | 1 |
| Chandigarh | 4 | 0 |
| Pondicherry | 4 | 1 |
| Tripura | 1 | 0 |

Source: Demand Study for Select Medicinal Plants, vol (1-a) Dept. of ISM&H, Govt, of India

The requirement of individual pharmacy varies depending upon the total number of quantity of high and low values of medicinal herbs used by them. For example Gufic, Mumbai requires annually 49.5 tones of raw material out of 49 species while Shree Dhootapapeshwar Ltd., Mumbai requires 204 tones of material of 30 species, Ms. Sandu Brothers Ltd., Mumbai need 1760 tones of 156 species per annum. The average requirement for eight pharmacies is 1291.8 tones per annum of 130 species costing about Rs. 4,07,52,184. The total crude drug demand of govt, and pharmacies (1998-99) vary from 60 tones for M.P. to 2300 tones for Kerala. Based on the data available through published sources and quick assessment survey conducted by the Group on Pharmacy Linkages, it is estimated that the current demand of medicinal plants is about 2.4 lakh tons annually and it is growing at the rate of about 20 % per year. This demand pertains to the internal consumption only. (Task Force Report, 2001).

The unsustainable ways of harvesting and unrestricted marketing have led to the reduction in population of some of the high demand species leading to sudden price rise and short supply in the market. Some of the major pharmaceuticals like Dabur, Zandu, Himalaya drugs, AVS, Kottakal etc. have started promoting contract farming to meet their demand.

Due to growing levels of public awareness in herbal products both in domestic and global markets and projected growth 20-30% of the industry, quality control and standards have become very important. In view of this Govt, of India, Ministry of Health & F.W. (DoISM&H) in the year 1997 notified and published Good Manufacturing Practice (GMP). It is now mandatory for all manufacturers to obtain GMP certificates from Drug Controlling Authority of government.

Registered Practitioners and Folk healers

Practitioners are another major category of users of medicinal herbs after the manufacturing units. Though their use of herbs by converting them into medicinal preparations is declining (as several practitioners use ready made medicines prepared by manufacturing units), however, there still are thousands of traditional practitioners, who believe in processing the plants themselves and preparing the medicines for the patients. The number of registered practitioners in the ISM&H is given below:

Registered ISM Practitioners in India

| Indian System of Medicines | No. of Practitioners |
|----------------------------|----------------------|
| Ayurveda | 427504 |
| Siddha | 16599 |
| Unani | 42445 |
| Naturopathy | 429 |
| Homeopathy | 194147 |
| Total | 681124 |

Source: National Policy on ISM&H, 2002, Govt of India

In the following table Medical System - wise usage of medicinal plant/ raw materials being used is given :

System wise Usage of medicinal plants

| System | Percentage |
|-------------|------------|
| Ayurveda | 81.70% |
| Folk | 67.97% |
| Homoeopathy | 14.90% |
| Modern | 06.38% |
| Siddha | 56.72% |
| Tibettan | 23.77% |
| Unani | 52.29% |

Folk Practitioners

There are estimatedly around 1 million folk practitioners inhabiting 6 lakhs odd villages of India, apart from the licensed practitioners. They in fact form the non-commercial users of medicinal plants primarily depending on the ecosystem using locally available approx. 8000 species of plants for their

health care needs. Such noncommercial users include housewives/ mothers, traditional birth attendants, bone setters, herbal healers, Vish Vaidyas and other specialists.

Import and Export

Global Trade in Medicinal Plants

The medicinal plants export share of India is nearly 13% in the global market, which is estimated at US \$ 1.03 billion. However, in the global herbal market (incl. medicines, food supplements, cosmetics etc.), which is estimated to be US \$ 62 billion, Indian share is negligible. According to the trade analysis systems of ITC, Geneva/ UNCTAD, leading exporters of medicinal plants are China, USA, India, Germany and Korea. Top ten exporting countries accounted for 85% of global exports. China is the leading player with 26% of global exports while India is a third major exporter with nearly 9% of global exports in 2000. Leading importers of medicinal plants are Hong Kong, USA, Germany, Japan, France, Korea Republic, Italy, China, Malaysia and Singapore. These top ten countries together accounted for over 70 percent of global imports.

Import

All the raw materials used by the Pharmacies are not of indigenous origin. Considerable supplies are received from Nepal, Bhutan, Bangladesh, Pakistan, Afganistan, Singapore etc., often through informal routes. For instance most of the 'Chirata' and other Himalayan medicinal plant / crude drugs come from Nepal and Bhutan, 'Oleoresin gugul of best quality from Pakistan, 'Liquorice' from Afganistan and good quality of 'Banshalochan' from Singapore. According to the data 'received from CHEMEXCIL, of the total estimated annual demand of 31,780 tons of raw herbal material of pharmaceutical industries, 7180 tons is met with through import. The requirements of Akkalkada-*Anacclus pyrethrum*, Jestimadh - *Glycirrhiza glabra* (Pakistan, Iran, Afganistan), Dalchini-*Cinnamomum zeylanica* (China) etc. are mostly met through imports. About 90% requirements of Gugul (*Commiphora wightii*) is received from Pakistan. The data of CHEMEXCIL however, doesn't include any information in respect of import of medicinal plants of foreign origin and finished products thereof, such as Ginko biloba, Ginseng, St. John's Wort, Selimarine and such other items.

Leading importers of medicinal plants are Hong Kong, USA, Germany, Japan, France, Korea Republic, Italy, China, Malaysia and Singapore. These top ten countries together accounted for over 70 percent of global imports. Hong

Kong and USA together accounted for more than 30 percent of global imports. The analysis of importing pattern of major countries reveals that Hong Kong sourced more than one-third of its imports from China. Other major source countries include USA, Canada, Korea and Japan. USA has primarily sourced its medicinal plants and products from India and China. These countries together accounted for over 50 percent of USA's imports. (Trade Analysis Syst. ITC, Geneva)

Export

Export opportunities of natural products are tremendous, as the world market is looking towards natural sources for the purposes of therapeutic use as well as nutritional dietary supplements. The global herbal remedies market can be classified into five strategic areas viz. i) Phyto-Pharmaceuticals ii) Medicinal Botanicals/ Botanical Extracts/ Herbal or Dietary Supplements iii) Nutraceuticals iv) Cosmeceuticals v) Herbal raw material. Herbal raw material market is very large but no definite estimates are available to quantify its size in dollar terms. Immense opportunities for Indian herbal industries exist in global herbal market in view of its vast herbal resources.

Apart from domestic requirement of medicinal plants for internal consumption, India exports crude drugs mainly to developed countries, viz, USA, Germany, France, Switzerland, UK and Japan, which share between them 75 to 80 percent of the total export of crude drugs from India. The principal herbal drugs that have been finding a good market in foreign countries are species of *Aconite*, *Aloe*, *Belladonna*, *Acorus*, *Cinchona*, *Cassia (tora)*, *Dioscorea*, *Digitalis*, *Ephedra*, *Plantago* (Isabgol), *Cassia* (Senna) etc. The total value of export of crude drugs, has increased from Rs.394 crores in 1996-97 to Rs. 446 crores in 1998-99. (Source: Planning Commission - Task Force Report, 2000).

The available international information (Trade Analysis Syst., ITC, Geneva, 2000) on exports of medicinal plants by India revealed that India exported around US \$ 80 million worth of medicinal plant to the world in the year 2000. Leading markets for India are USA, Japan, Germany, UK, Taiwan, Italy, France, Indonesia, Pakistan and Hong Kong. However, the statistical analysis released by Directorate General of Commercial Intelligence Statistics (DGCIS) showed that India exported medicinal plant valued at US \$ 98 million in the year 2001-02.

Sizeable number of medicinal plants used in ISM&H medicines all over India are exported and also imported from other countries. In the following tables

habit-wise Exported/ Imported medicinal plants and their percentage used in various medical systems and Leading exporters of medicinal plants is given:

Export/Import Analysis of Traded Plants Habit-wise

- Out of 880 traded species
- Exported from India 44 Spp.
- Species imported from foreign countries 42 Spp.

| | Exported | Imported |
|----------|---------------|----------|
| Herbs | 23 Spp. (49%) | 14(33%) |
| Trees | 17 Spp. (35%) | 16(39%) |
| Shrubs | 4 Spp. (8%) | 19 (21%) |
| Climbers | 4 Spp. (8%) | 3(7%) |

Source : FRLHT, Trade Database, 2003 and DGCIS.

Medical Systems-Wise medicinal Plants Exported / Imported

| Exported (%) | Systems | Imported (%) |
|--------------|------------|--------------|
| 88.58 | Ayurveda | 65.66 |
| 78.16 | Folk | 40.47 |
| 67.75 | Siddha | 32.33 |
| 46.91 | Tibetan | 13.28 |
| 31.25 | Homeopathy | 30.95 |
| 28.16 | Modern | 22.80 |
| | Unani | 56.14 |

Source: FRLHT, Nomenclature Browser, 2003

Leading Exporters of Medicinal Plants

(SITC Code 2924 - Plants and parts of plants primarily used for pharmacy, perfumery and insecticides: fresh, dried, powered-US \$ million).

| Exporting Countries | 1999 | 2000 | 2001 | % |
|---------------------|--------|--------|--------|------|
| China | 211874 | 216526 | 199702 | 23.8 |
| USA | 104294 | 105215 | 76344 | 11.6 |
| India | 44151 | 79454 | NA | 8.76 |
| Germany | 65564 | 55514 | 52555 | 6.12 |

| Exporting Countries | 1999 | 2000 | 2001 | % |
|---------------------|--------|--------|--------|------|
| Korea Rep. | 58624 | 54944 | 47832 | 6.06 |
| Singapore | 42689 | 44559 | 42098 | 4.92 |
| France | 45823 | 54344 | 53031 | 6.00 |
| Canada | 32777 | 29761 | 46818 | 3.28 |
| Chile | 28899 | 20463 | 22990 | 2.25 |
| Poland | 20843 | 18419 | 14817 | – |
| All Countries | 903954 | 906004 | 759305 | – |

Source: Trade Analysis System of ITC–Geneva

Major Foreign Exchange Earning Item (Crude Drugs and Extracts)

Of the selected 59 items, the major value earners are Psyllium husk, saps and extracts, Kambodge extracts, extracts N.E.S., Henna powder, Ayurvedic and Unani herbs N.E.S., other crude drugs Senna leaves and pods, Sandal wood chip and Karaya gum. In the classification of the items under the categories; Ayurvedic and Unani herbs/crude drugs etc. no clue regarding the plant source is given. However, 48 species have been identified as export item from DGCIS statistics. The data of top 10 medicinal plants is given in the following table:

Export of Top 10 Medicinal Plants and Extracts (2001-2002)

| Sl. No. | Item Code ITC | Items | | Value (US \$ Million) |
|---------|---------------|----------------------------------|----------|-----------------------|
| 1 | 12119015 | Psyllium Husk (Isobgul husk) | 25581.75 | 50.55 |
| 2 | 13021100 | Saps and Extracts of Opium | 192.14 | 16.82 |
| 3 | 13021908 | Cambodge Extract | 920.89 | 9.27 |
| 4 | 13021919 | Extracts, N.E.S. | 628.73 | 8.16 |
| 5 | 14041013 | Henna Powder | 6732.89 | 7.20 |
| 6 | 12119026 | Ayurvedic and Unani Herbs N.E.S. | 7451.64 | 6.67 |
| 7 | 12119049 | Other Crude Drugs | 3861.83 | 5.90 |
| 8 | 12119022 | Senna leaves and Pods | 8237.85 | 5.79 |
| 9 | 12119018 | Sandal wood chips and Dust | 471; 42 | 3.77 |
| 10 | 13019006 | Karaya Gum | 169.38 | 3.56 |
| | | Total Above | 55695.52 | 117.69 |
| | | Grand Total (57 items) | 67270.22 | 133.28 |

(Source: Indian Trades, CMIE, and Statistics of the Foreign Trade of India by countries, DGCIS, GOI, Calcutta, 2001-02)

Apart from these India has also exported extract totaling US\$ 36 million in the same year. An analysis of 59 crude drugs and extracts exported from India in 2001-02 showed that high value crude drug represents 60% of the total export income while herbal extracts (incl. Garcinia/ Kambodge, liquorice etc.) accounts for 27% of the export earnings and other low value crude drugs (Neem leaves, seed, *Vinca rosea* etc.) represents 13% of exports (DGCIS, 2001-02).

Most of the developed countries like USA, UK, Japan, Germany and France are the major markets for the botanicals like Senna, Psyllium husk, Henna etc. Out of the 10 widely traded items Henna powder is one of the top export items exported to West Asian region (UAE, Syria, Saudi Arabia and Turkey). The, laxative items are primarily exported to developed countries.

Major Markets of India

The top 10 markets for India for exports of plants and plant based products is given in the table below. USA is by far, the leading importer of crude drugs and extracts accounted for 50% of India's medicinal plants export earnings followed by Japan, France, UK, UAE and Germany.

Top 10 Markets for India for Export of Plants and Plant Based Products

| Sl. No. | Country | Quantity (tons) | Value (US\$ Million) |
|---------|-----------|-----------------|----------------------|
| 1 | U.S.A. | 21322.01 | 67.63 |
| 2 | Japan | 6251.27 | 9.59 |
| 3 | France | 3343.81 | 4.71 |
| 4 | U.K. | 2128.86 | 4.00 |
| 5 | UAE | 1861.01 | 3.46 |
| 6 | Germany | 2375.87 | 3.16 |
| 7 | Indonesia | 1095.04 | 2.97 |
| 8 | Spain | 1335.45 | 2.65 |
| 9 | Taiwan | 4688.16 | 2.44 |
| 10 | Australia | 923.89 | 2.16 |

Source: India Trades, CMIE, and Statistics of the Foreign Trade of India by countries, DGCIS, GOI, Calcutta, (2001-2002).

Export Earnings/Trends

An analysis of exports of plants, extracts and crude drug from India reveal that the highest earnings of Rs. 463 crore is from crude drugs followed by

finished products (Rs. 240 crore) and extracts (Rs. 171 crore). The trends in exports of medicinal plants indicate an increasing trend over the last three years. As regards the region specific export trends the analysis indicates that India increased its exports to North America significantly in the year 2001-02. However, India has lost export opportunities moderately in all other regions, except Africa. The exports to Africa increased from US \$ 1.15 million in 2000-01 to US \$ 1.73 million in 2001-02.

Herbal Markets Profile in USA

According to an estimated information (Commerce Deptt, US Bureau) in 2001. USA has imported US \$ 604 million worth of herbal products (as defined by HTS) which includes herbal tea, herbal infusions, vegetable saps, extracts, pectates, ginseng etc. India was the largest US supplier of herbal products with shipments to totaling US \$ 121 million (20% import market share), followed by China 14%, Australia 9% and Denmark 7%. India has an edge in the US market for herbal products over other suppliers such as China, while for some products such as Opium and Psyllium husk practically India is the only supplier. There is substantial scope for export. Export data of some of the herbal products to USA is given here under:

U.S. Imports of Vegetable Saps, Extracts, Pectates etc. (HTS # 1302)

| Major Suppliers | | Millions of U.S. Dollars | | % Share | |
|-----------------|-----------|--------------------------|--------|---------|-------|
| | | 2000 | 2001 | 2000 | 2001 |
| Rank | World | 450.13 | 455.15 | 100 | 100 |
| 1 | India | 95.67 | 81.73 | 21.25 | 17.96 |
| 2 | Australia | 33.86 | 51.35 | 7.52 | 11.28 |
| 3 | Denmark | 31.22 | 41.75 | 6.94 | 9.17 |
| 4 | China | 44.83 | 39.90 | 9.96 | 8.77 |
| 5 | France | 32.45 | 34.85 | 7.21 | 7.66 |

(Source: US Department of Commerce, Bureau of the Census)

The table shows that India is on the top of the U.S. import market for herbal products in 2001 exporting vegetable sap, extracts and pectates.

In the export of Opium India cornered the entire 100% U.S. market worth US \$ 39 million in 2001. There were nil exports from Turkey. Another major export item Guar gum (*Cyamopsis tetragonoloba*) is primarily valued for its seed gum, which is emulsifier and stabilizer used in food products, cosmetics and pharmaceuticals. It's cultivation in U.S. may affect its export potential from India. India has topped in the export of Guar gum in 2001 followed by Pakistan.

It has nearly 70% share in the over all export of Guar gum to U.S.A. The export data are given here under.

U.S. Imports of Pectates : Mucilages/Thickeners from Guar Seed (HTS # 1302.32.0020)

| Major Suppliers | | Millions of U.S. Dollars | | % Share | |
|-----------------|----------|--------------------------|-------|---------|-------|
| | | 2000 | 2001 | 2000 | 2001 |
| Rank | World | 53.70 | 38.93 | 100 | 100 |
| 1 | India | 39.70 | 26.98 | 73.92 | 69.31 |
| 2 | Pakistan | 8.19 | 6.71 | 15.25 | 17.23 |
| 3 | France | 1.33 | 1.31 | 2.48 | 3.36 |
| 4 | Morocco | 1.45 | 0.91 | 2.7 | 2.34 |
| 5 | UK | 0.88 | 0.80 | 1.63 | 2.05 |

(Source: US Department of Commerce, Bureau of Census)

In the export of the plants for pharmacy, perfumes, insecticides etc. in 2001 India again led with export worth US\$ 38 million followed by China US\$ 36 million as given here under:

U.S. Imports of Plants etc., for Pharmacy, Perfume, Insecticides etc. (HTS # 1211)

| Major Suppliers | | Millions of U.S. Dollars | | % Share | |
|-----------------|-----------|--------------------------|--------|---------|-------|
| | | 2000 | 2001 | 2000 | 2001 |
| Rank | World | 132.52 | 137.44 | 100 | 100 |
| 1 | India | 28.78 | 37.75 | 21.72 | 27.47 |
| 2 | China | 39.28 | 35.80 | 29.64 | 26.05 |
| 3 | Germany | 6.48 | 7.19 | 4.89 | 5.23 |
| 4 | Italy | 4.24 | 6.19 | 3.20 | 4.50 |
| 5 | Hong Kong | 6.69 | 6.06 | 5.05 | 4.41 |

(Source: US Department of Commerce, Bureau of Census)

The Psyllium seed husk better known in India as Isabgol is another item in which India has topped among exporters to U.S.A. market which is known for its natural bulking ability. India exported US\$ 31 million worth Isabgol to U.S.A. in 2001 (see table below). As there is no competitor for India over this item, the scope for growth is considerable and further growing.

U.S. Imports of Psyllium seed husks, fresh or dried, having

Anesthetic, Prophylactic or Therapeutic properties and Principally used as medicaments or ingredients (hts # 1211.90.8020)

| Major | Suppliers | Millions of U.S. Dollars | | % Share | |
|-------|-----------|--------------------------|-------|---------|------|
| | | 2000 | 2001 | 2000 | 2001 |
| Rank | World | 24.63 | 31,39 | 100 | 100 |
| 1 | India | 24.62 | 3139 | 99.96 | 100 |
| 2 | Canada | 0.01 | 0.00 | 0.04 | 0 |

(Source: US Department of Commerce, Bureau of the Census)

The herbal/convenience iced teas comprising of mixed herbs is one of the item in which India has topped the export list with 18.48% share followed by China 17.18% as given in the table below.

U.S. Imports of Herbal Teas and Herbal Infusions Comprising Mixed Herbs – NESOI (HTS # 2106.90.9987)

| Major | Suppliers | Millions of 1 | U.S. Dollars | % Share | |
|-------|-------------|---------------|--------------|---------|-------|
| | | 2000 | 2001 | 2000 | 2001 |
| Rank | World | 8.86 | 11.08 | 100 | 100 |
| 1 | India | 0.30 | 2.05 | 335 | 18.48 |
| 2 | China | 1.96 | 1.90 | 22.11 | 17.18 |
| 3 | Canada | 1.35 | 1.48 | 15.21 | 13.38 |
| 4 | South Korea | 0.78 | 0.99 | 8.76 | 8.97 |
| 5 | UK | 0.74 | 0.81 | 8.4 | 7.35 |

(Source: US Department of Commerce, Bureau of the Census)

Potentials Herbs

As per information from local pharmacies, herbal products based on the following herbs have a good market potential in U.S.

1. Echinacea (*Echinacea purpurea*) used as an immuno-stimulant in the treatment or prevention of colds, flu, bacterial and fungal infections, cancer, arthritis etc. However, it is not recommended for long term, continuous use.
2. Garlic (*Allium sativum*) - One of the most versatile medicinal plants. Scientific studies have shown its beneficial effect for coronary heart

disease patients, lowering blood pressure and regulating the circulatory system. There is a good market for garlic based herbal products in USA.

3. Ginger (*Zingiber officinale*) Said to have positive effects on heart tissue, to be useful in treatment of arthritis, as well as motion sickness and nausea. There is a good and growing market in USA for ginger based products.
4. Maidenhair tree (*Ginkgo biloba*) products are among the most popular herbal dietary supplements in the US. It is touted here as a way to beat life's aging process, normal body deterioration and useful in vascular diseases. Its market is already large and growing. In Germany, the extract from *Ginkgo biloba* leaves has been prescribed for circulatory system disorders and its retail sales are over US\$ 700 million annually.

Strategies for Export Promotion

In view of the rich biodiversity, traditional knowledge heritage and fast growth of herbal global market, India needs to improve pattern of export and should develop 'gold standards' through organic cultivation, effective post harvesting, storage technologies and better extraction methodologies. In 2001, India topped among the exporters of certain items to USA as given above. It is necessary for Indian manufacturers and policy makers to identify the "best Indian plants" (along with associated spp.), most traditionally reputed products for exports in each of the different global market segments. Some of the criteria for promotion or selection of species could be the following:

1. Identification of highly reputed products based on Indian traditional knowledge for such health care applications which can cater to the universal set up of health needs.
2. Associated knowledge product should be identified for: i. Human use preventive, promotive, curative ii. Veterinary care iii. Cosmeceuticals iv. Nutraceuticals and v. Agricultural use.
3. Selection of species which can be easily grown/ cultivated by households in wide range of habitats and agro-climates.
4. Selection of species should preferably be herbs/ tuberous herbs, grasses, climbers, shrubs and lastly trees.
5. The final selection of products should be based on market survey to match the acceptance of the Indian products to consumer needs in different global market segments.

The Inner Story – The Trade of Medicinal Plants

Survival on the Forests

It is an accomplished fact that owing to rich vegetation and forests of our country over 90% population live traditionally in rural areas, in and around forests since ages and utilize forest produce for their day to day needs including medicines. Even now dependency on forests and forest produce is size-able. According to some studies and estimation** given below, a large section of rural population, including tribals, depend on the forests and the forest produce for their survival. The data is just on two states of the country, forest dependency number may even be more.

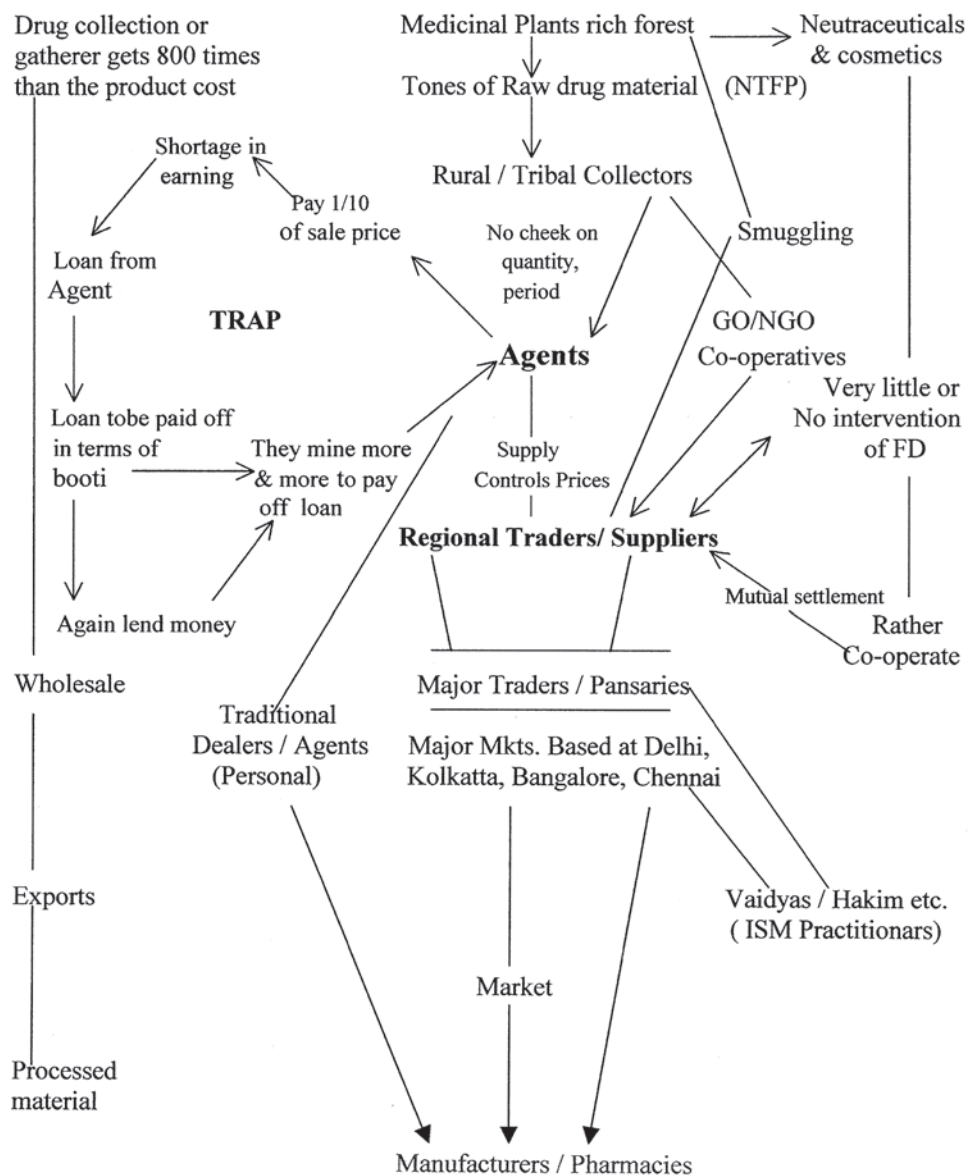
| | | |
|---|---|---------------------------|
| No. of people live in and around forest and rely on NTFP for survival: | - | 50 million |
| Poor and under employed people rely on Collection and processing of medicinal plants yield Annual employment | - | Over 35 million work days |
| No. of persons (average) enter in forests of Tamil Nadu State each day to collect forest produce including medicinal plants : | - | 1 million |
| No. of people in Rajasthan sustain themselves Through collection/processing and marketing of NTFP (incl. raw drugs): | - | 5 million |

National Center for human settlements and Environment, Bhopal.'Down to Earth' Jan. 2001.

The resource base or the base material, for pharmacies in the Medicinal Plants Sector is the biodiversity rich forests distributed in various types of Habitats. Local poor Tribals or rural gatherers (forest dwellers), are in fact the collector and carrier of the raw drugs for the Industry. They depend on herb gathering for their survival. They collect all types of whole plant or different parts of (high & low value) herbs for their Agent who in turn pay Rs.350-400 to them, the amount little less than what is actually required i.e.Rs.500/- per week/family for their lively hood (i.e. food, liquor, Tobacco etc.). Thus, the family is now short of Rs. 100-150/- before they start work for the next week in the forest. The herb gathering knowledge of the tribals is exploited by the monopolistic agent/ local forest officials. The poor gatherer need money for their sustenance, The agent now trap the poor gatherer and offer a loan, which is to be paid in terms of collection of herbs along with next week's collection. The vicious circle is set, the loan is never paid in full and keep on mounting and gatherer are always

under pressure to collect more and more. They never come out of the deadly clutches of the agent. Thus the agents and traders through exploitation of local people strip the forests off their medicinal wealth. The forest deptt express their helplessness. The exploited species of plants become endangered and the list of threatened plants keep on increasing, while some of them are heading towards extinction.

The Inner Story (The Herbal Heist)



The supply chain of medicinal herbs starts from the local people herb gatherers, mostly tribals. They being poor and needy, are rather forced to mine the drugs more and more, at a very nominal cost for their survival and to pay-

off loans to the Agent. The Agent sells to the local Traders who in turn sale it further to the regional traders or directly to the major traders or pharmacies. The forest department (FD) officials are silent spectators or have mutual understanding with the agents/ traders. The major markets for these items at the national level are Khari Baoli, Delhi; Bara Bazar, Kolkata; Avenue Rd., Bangalore and GBN Street Chennai.

Legal Aspects

Some of the species like Kuth (*Saussurea costus*) and many others which are prohibited from wild for exports by CITES are also being collected and traded. Export and import (Exim) of medicinal plants in India is regulated by the Exim policy of GOI and CITES (Convention on International Trade in Endangered species of wild flora and fauna). For export of the species in Append. - H of CITES list, a certificate of cultivation is required. But for traders it is not a problem, they can bribe officials or by forging document, they manage. The Govt, in their recent order (MoEF) has barred just 114 species and freed export of all medicinal plants from wild. It is a welcome decision for the traders, opening everything for trade from wild without any supporting conservation/ cultivation mechanism, and it is only going to denude the forests. Moreover, there is no parallel domestic legalization that curbs illicit exploitation of herbs in wild. In domestic trade it is not compulsory to indicate source/ origin of plant, wild or cultivated, except in NTFP list, which is not forceful.

The FD maintain that there is no illegal trade in their region (and along International border) and also no shortage of staff. At times seizures are carried out as a face saving exercise by the FD, as was reported to be done in Sept 1999 in Raxaul in West Bengal. A consignment of 7114 kg. of Sarpagandha (*Rauwolfia serpentina*) was seized at the Kolkata dock, but only a small penalty was imposed. Like wise the collection of banned item, high altitude Himalayan species *Saussurea lappa* root in thousands of kg and of *Taxus baccata* 450314 Kg. which was transported illegally, without any check all the way from the Himalayan ranges to South India and was seized in Tamil Nadu, is an interesting example of the on going Herbal heist. (Chakrabarty & Varshney 2001). This is just a small part of the Inner Story of Herbal Trade in Medicinal plants sector of our country.

Trade across International Borders

The border stretch between India, Nepal and Bhutan particularly along the West Bengal and Bihar are free - for - all herb trade areas. The number

of critically endangered species in high demand such as Mamira (*Coptis teeta*), Agar wood (*Aquilaria malaccensis*), Sarpagandha and 'Talis-patra' etc. find their way from the East and North eastern parts including Nepal, China, Myanmar and Bhutan to Kolkata market, usually illicitly. According to Hiraknandy Consultant, WWF - Kolkata, some of the herbs in gunny bags are brought into India or taken to Nepal etc., or some times hidden within unbanned items in trucks or in materials of daily use and pass it on the villages on other side of the border. Sometimes the collection from Assam and Arunchal Pradesh forests are smuggled in to Nepal from where it is re-exported to India with a certificate of cultivation. Such practice is done by bigger traders, wholesalers etc. visiting personally to the site.

The above facts have been further supported in an interesting survey by "Down to Earth" team - Leena Chakrabarti and Vibha Varshne(2001) in an attempt to find out the effects of illegal trade on ISM and why cultivation of these valuable plant is still not a business. The survey gave interesting first-hand information on details of *modus operandi* on the exploitation of the plant collectors, smuggling raw drugs from the forests etc. was conducted in some parts of India, including Madurai area in Tamil Nadu and Dehradun area (U.P.).

Madurai area : In the rich forests of Shenbaha Thopu, 24 families of Pallyan community are involved traditionally in collecting non-timber forest produce (NTFP). This community has now been exploited of their raw drug collecting knowledge by an agent Selvam, master of the area and local forest officials, Nearly 197 species of medicinal plants are collected and smuggled out of the forests. The tribal people who are in the clutches of the agent have to collect the required herbs for their lively hood and to repay the unending loans. The agent Selvam never rejects a loan. Similar is the story in a near by forest area Thaniparai in Rajapalyam with 1660 ha of protected forest. The range forest officer is usually absent for months and the office is occupied by the forest Guard. Here also the situation is no different from Shenbaha, here the monopolistic agent is Sundaram. Like Selvam, he also lends money to the needy tribal people whenever they need. They repay by selling their collection of herbs. To pay back the loans and also the interest, the gatherers keep going deeper into the forests. They do not have direct access to traders and even if they try to sale directly to traders, Sundaram's men and forest officials threaten them to harm physically. About the 'law' and forest officials, he says - "What Laws? There are no laws here." He has a warehouse for storing medicinal plants. According to him this help him to control flow of herbs to the market and regulate the prices. As regards exploitation of gatherers, he denies that they are exploited. According to him he pays quarter of the profits he gets after

selling the plants to the traders. However, the survey of *Down to Earth* reveals that the tribals get very little i.e. one tenth of the amount Sundaram gets from traders.

According to an oral agreement with the FD, a NGO, Society for Tribal Development (STD) is authorized for collection of 10 species. But usually 20 times more collection is done for smuggling purpose. The STD is unable to affect the Sudaram's strong hold over the gatherers.

Material and Market

As regards selling price, the species like *Gymnema sylvestre* (Gurmar) an endangered species in the area is sold to the agent for Rs. 10/- per kg while the agents sale them in the market for Rs. 40/- per kg. Similarly there is a vast difference between the amount paid to gatherer for a raw material and subsequent prices for the processed material derived out of it, as given in the table here under for 3 species :

The Herb Gatherer is Paid Almost 800 Times less than the price the product Fetches in the Market

| Species | Gatherer (Rs.) | Wholesale (Rs.) | Exporter (Rs.) | Processed material (Rs.) |
|-----------------------------|----------------|-----------------|----------------|--------------------------|
| <i>Solanum xanthocarpum</i> | 1.5 | 7 | 15 | 1,200 |
| <i>Phyllanthus niruri</i> | 0.75 | 4.5 | 08 | 1,900 |
| <i>Centella asiatica</i> | 15 | 30 | 38 | 1,940 |

Note : The gatherer price is for one kg of the material and the price of the final product is what is derived from one kg of the material.

Source: K. Kamraj, *et.al* 1997, 'Value addition industries of Madurai', Dissertation for American College, Madurai, April.

According to an estimate during 1997-98, 188 varieties of raw drugs measuring about 250 metric tones of dry materials derived from 169 species were traded in Madurai market alone. About 10000 drug gatherers are employed for collecting raw drug material for 10 odd major traders. The collection from the forests of Shenbaha Thopu and Thaniparai finally reaches Virudhnagar and Madurai markets from where it is exported out side country through Tuticorn port.

Himalaya - Dehradun area U.P. : In one of the incidents (April, 1999) 12 truck loads carrying various quantities of medicinal plants, not listed in NTFP (banned material), waiting at the check post, were tipped off by the Director

of a reputed environmental NGO in Dehradun. The trucks were forced to halt due to strike. He tried to gather support from various quarters, including forest Dept. (FD) to take action, but to no avail. When the strike ended the trucks left for their destination, unchecked. This is just one incidence of the kind, tones of plants are smuggled every day from the Himalayan area, which can be called as herbs Smuggler's paradise.

Of late, over a decade, in U.P. (presently Uttaranchal) collection of certain herbs (not banned) from the forest land is being done through the agency of 'Bhesaj Sangh' on contractual basis, whose members include forest-dependent local persons. The FD's role ends after the contract is signed. "How they execute is their sole prerogative" says the Dy. Conservator of forest, Dehradun circle to the 'Down to earth' team. The problem starts there after. How and in what quantity, through how many routes, the collection of medicinal wealth goes out, there is no check or regulation. The money paid to the drug collectors by the Co-operative is much less than the rates offered by private traders. For example, for collection 'Kutki' (*Picrorhiza kurroa*) Rs. 22.25 per kg is paid by the co-operative while the traders offer Rs. 56/-; per kg., to encourage gathers to sell through illegal channels. Survey in Arunachal Pradesh showed that the gatherer gets Rs. 4/- for 1 kg of 'Talis patra' (*Taxus wallichiana*) while it is sold for Rs. 35/- kg in the near by market. The price multiplies at each level.

A study conducted by Traffic-India showed that among the traded species availability of 'Ativisha' (*Aconitum heterophyllum*) and *Podophyllum hexandrum* is decreasing at the rate of 26 - 50% annually.

In Kerala also there is vast differences i.e. 767 - 1757 percent, between the prices offered by Girijan Co-operative Society (managing collection of 120 NTFP) and the local traders. This fact has been reported by an International Development Research Center, Kerala based on a study conducted around Trivandrum, Kerala in their report, the data on 9 drugs are given here under:

The Price Offered by Co-operative and Local Traders varies by as much as 1,757 percent

| Species | Price offered by cooperatives (Rs) | Price offered by traders (Rs) | Percentage of variation in price |
|------------------------------|------------------------------------|-------------------------------|----------------------------------|
| <i>Adhatoda vasica</i> | 1.40 | 13.75 | 882 |
| <i>Eclipta alba</i> | 1.00 | 8.67 | 767 |
| <i>Clerodendron serratum</i> | 1.90 | 28.00 | 1,374 |

| Species | Price offered by cooperatives (Rs) | Price offered by traders (Rs) | Percentage of variation in price |
|---------------------------|------------------------------------|-------------------------------|----------------------------------|
| <i>Cyperus rotundus</i> | 1.90 | 12.75 | 571 |
| <i>Syzigium cumini</i> | 1.40 | 16.67 | 1,091 |
| <i>Tragia involucrata</i> | 4.75 | 29.88 | 529 |
| <i>Helicteres isora</i> | 1.15 | 10.50 | 813 |
| <i>Phyllanthus amarus</i> | 1.00 | 18.57 | 1,757 |
| <i>Momordica dioca</i> | 3.30 | 37.67 | 1,042 |

Note: The study was conducted in and around Trivandrum, Kerala.

Source: J. Holley and K. Cherla, 1998. The Medicinal Plants Sector in India, International Development Research Centre, New Delhi, p 44.

Chaotic Situation

The situation is very serious, the trade is going on, while the precious medicinal species from the forests whether in South, East, West or North India are stripped off their treasure. One can collect any amount of the medicinal herbs paying very little amount to the drug collector, who is in the clutches of the trader. Every day tons of truck loads of raw drug material, worth millions of rupees is collected by hundreds of Veerappan like agents/ traders and is smuggled from the forests to markets within and out of Country. The vicious nexus of the traders directly with the manufacturers is also in practice. In short the unorganized, unregulated illicit harvesting and trade in medicinal plants sector is a 'free for all' zone. Under these circumstances, what will be the fate of ISM drug manufacturing industry in the Country? This is the Inner Story behind our tall and great claims of rich biodiversity/ boosting exports and quality drugs.

* Plants, Plant portions and their derivatives and extracts obtained from the wild prohibited for exports

1. *Cycas beddomei* (Beddom's cycad)
2. *Vanda coerulea* (Blue vanda)
3. *Saussurea costus*
4. *Paphiopedilium species* (Ladies slipper orchid)
5. *Nepenthes khasiana* (Pitcher plant)
6. *Renanthera imschootiana* (Red vanda)

7. *Rauwolfia serpentina* (Sarpagandha)
8. *Ceropegia species*
9. *Frerea indica* (Shindal Mankundi)
10. *Podophyllum hexandum* (emodi) Indian Podophyllum)
11. *Cyatheaceae species* (Tree ferns)
12. *Cycadacea species* (Tree ferns)
13. *Dioscorea deltoidea* (Elephants Foot)
14. *Euphorbia species* (Euphorbias)
15. *Orchidaceae species* (Orchids)
16. *Pterocarpus santalinus* (Redsanders)
17. *Taxus wallichiana* (Common Yew or Birmi leaves)
18. *Aquilaria malaccensis* (Agarwood)
19. *Aconitum species*
20. *Coptis teeta*
21. *Coscinium fenestratum* (Calumba wood)
22. *Dactylorhiza hatagirea*
23. *Gentiana kuroo* (Kuru, Kutki)
24. *Gnetum species*
25. *Kampheria galenga*
26. *Nardostachys grandiflora*
27. *Panax pseudoginseng*
28. *Picrorhiza kurrooa*
29. *Swertia chirata* (Chirayata)

** List of Prioritized Plants for Development and Cultivation Under Scheme of NMPB

Plants Eligible for 20% subsidy

| # | Botanical Name | Common Name | Eligible subsidy (%) | Remark |
|----|--------------------------------|-------------|----------------------|--------|
| 1. | <i>Acorus calamus</i> Linn. | Vach | 20 | |
| 2. | <i>Aloe vera</i> (Linn.) Burn. | Ghritkumari | 20 | |

| # | Botanical Name | Common Name | Eligible subsidy (%) | Remark |
|-----|--|-----------------------------|----------------------|-----------------|
| 3. | <i>Andrographis paniculata</i> (Linn. Burn | Kalmegh | 20 | |
| 4. | <i>Artemisia annua</i> (Linn.) | Artemisia | 20 | |
| 5. | <i>Asparagus racemosus</i> Willd. | Shatavari | 20 | |
| 6. | <i>Azadirachta indica</i> A. Juss | Neem | 20 | |
| 7. | <i>Bacopa monnieri</i> (L.) Pennell | Brahmi | 20 | |
| 8. | <i>Boerhaavia diffusa</i> Linn. | Punarnava | 20 | |
| 9. | <i>Cassia angustifolia</i> vahl. | Senna | 20 | |
| 10. | <i>Caesalpinia sappan</i> Linn. | Patang | 20 | |
| 11. | <i>Centella asiatica</i> (Linn.) Urban | Mandookparni | 20 | |
| 12. | <i>Chlorophytum borivillianum</i> Sant. | Shwet Musali | 20 | |
| 13. | <i>Cinnamomum verum</i> Presl C. tamala and C. camphora | Dalchini, Tejpat, Kapoor | 20 | |
| 14. | <i>Coleus barbatus</i> Benth. | Pather Chur | 20 | |
| 15. | <i>Coleus vettiveroides</i> K.C. Jacob | Hrivera | 20 | |
| 16. | <i>Convolvulus microphyllus</i> | Shankhpushpi | 20 | |
| 17. | <i>Cryptolepis buchanani</i> Roem & schult | Krsna sariva | 20 | |
| 18. | <i>Digitalis purpurea</i> Linn. | Foxglove | 20 | |
| 19. | <i>Dioscorea bulbifera</i> Linn. | Rotalu, Gethi | 20 | |
| 20. | <i>Embelia ribes</i> Burm. f. | Vai Vidang | 20 | |
| 21. | <i>Emblica officinalis</i> Gaertn. | Amla | 20 | |
| 22. | <i>Garcinia indica</i> Choisy | Kokum | 20 | Commercial Crop |
| 23. | <i>Ginkgo biloba</i> | Ginkgo | 20 | |
| 24. | <i>Gymnema sylvestre</i> R. Br. | Gudmar | 20 | |
| 25. | <i>Hedychium spicatum</i> Buch-Ham.ex Smuth | Kapur kachari | 20 | |

| # | Botanical Name | Common Name | Eligible subsidy (%) | Remark |
|-----|--------------------------------------|--------------------------------------|----------------------|------------------|
| 26. | Hemidesmus indicus R.Br. | Anantmool, Indian Sarsaparilla | 20 | |
| 27. | Holarrhena antidysenterica Wall. | Kurchi/Kutaj | 20 | |
| 28. | Ipomoea petaloidea Choisy | Vrddhadaruka | 20 | |
| 29. | Ipomoea turpethum R. Br. | Trivit | 20 | |
| 30. | Litsea glutinosa | Listea | 20 | |
| 31. | Lepidum sativum Linn. | Chandrasur | 20 | |
| 32. | Mucuna prurita Linn. | Konch | 20 | |
| 33. | Ocimum sanctum Linn. | Tulsi | 20 | |
| 34. | Phyllanthus amarus Schum & Thonn. | Bhumi amlaki | 20 | |
| 35. | Piper longum Linn. | Pippali | 20 | |
| 36. | Pluchea lanceolata (DC) CB Clark. | Rasna | 20 | |
| 37. | Solanum nigrum Linn. | Makoy | 20 | |
| 38. | Stevia rebaudiana | Madhukari | 20 | Export Potential |
| 39. | Terminalia arjuna (Roxb.) Wt. & Arn. | Arjuna | 20 | |
| 40. | Terminalia bellirica Gaertn. | Behera | 20 | |
| 41. | Terminalia chebula Retz. | Harad | 20 | |
| 42. | Tinospora cordifolia Miers | Giloe | 20 | |
| 43. | Vitex negundo | Nirgundi | 20 | |
| 44. | Withania somnifera (Linn.) Dunal | Ashwagnadha | 20 | |
| 45. | Woodfordia fruitcosa Kurtz. | Dhataki | 20 | |

Plants eligible for 50% subsidy

| # | Botanical Name | Common Name | Eligible subsidy (%) | Remark |
|-----|------------------------------|-------------|----------------------|-------------|
| 46. | Aegle marmelos (Linn.) Corr. | Beal | 50 | LG, Root |

| # | Botanical Name | Common Name | Eligible subsidy (%) | Remark |
|-----|--|----------------------|----------------------|----------|
| 47. | <i>Albizzia lebeck</i> Benth. | Shirish | 50 | LG, Bark |
| 48. | <i>Alstonia scholaris</i> R.Br. | Satvin, Saptaparna | 50 | LG, Bark |
| 49. | <i>Altingia excelsa</i> Noronha | Silarasa | 50 | |
| 50. | <i>Anacyclus pyrethrum</i> DC. | Akarkara | 50 | |
| 51. | <i>Atropa belledona</i> | Atropa | 50 | |
| 52. | <i>Coscinum fenastratum</i> (Gertn) Colebr. | Peela Chandan | 50 | |
| 53. | <i>Crataeva nurvala</i> Buch – Ham. | Varun | 50 | LG, Bark |
| 54. | <i>Dactylorhiza hatagirea</i> (D.Don) Soo | Salampanja | 50 | |
| 55. | <i>Gloriosa superba</i> Linn. | Kalihari | 50 | |
| 56. | <i>Glycyrrhiza glabra</i> Linn. | Licorice Roots, Mu | 50 | |
| 57. | <i>Gmelina arborea</i> Linn. | Gambhari | 50 | LG, Root |
| 58. | <i>Hippophae rhamnoides</i> Linn. | Seabuckthorn | 50 | |
| 59. | <i>Inula racemosa</i> Hk.f. | Pushkarmool | 50 | |
| 60. | <i>Leptadenia reticulata</i> (Retz) Wt. & Arn. | Jivanti | 50 | |
| 61. | <i>Mesua ferrea</i> Linn. | Nagakeshar | 50 | LG |
| 62. | <i>Panax pseudo-ginseng</i> | Ginseng | 50 | |
| 63. | <i>Parmelia perlata</i> Ach. | Saileya | 50 | HA, SG |
| 64. | <i>Piper cubeba</i> Linn. f. | Kababchini | 50 | |
| 65. | <i>Plumbago zeylanica</i> Linn. | Chitrak | 50 | |
| 66. | <i>Pueraria tuberosa</i> DC. | Vidarikand | 50 | |
| 67. | <i>Premna integrifolia</i> Linn. | Agnimanth | 50 | HA, Root |
| 68. | <i>Pterocarpus marsupium</i> Roxb. | Beejasar | 50 | |
| 69. | <i>Rauwolfia serpentina</i> Benth. ex Kutz | Sarpagandha | 50 | MG, Root |
| 70. | <i>Salacia reticulata</i> , <i>salacia oblongata</i> | Saptachakra (Saptar) | 50 | |

| # | Botanical Name | Common Name | Eligible subsidy (%) | Remark |
|-----|---------------------------------------|-------------------------------------|----------------------|----------|
| 71. | <i>Saraca asoca</i> (Roxb.) De Wilde | Ashok | 50 | LG, Bark |
| 72. | <i>Smilax china</i> Linn. | Hrddhatri (Madhu Chob Chini Lokhan) | 50 | |
| 73. | <i>Stereospermum suaveolens</i> DC. | Patala | 50 | LG, Root |
| 74. | <i>Tacomella undulata</i> (Sm.) Seem. | Rohitak | 50 | |
| 75. | <i>Tylophora asthmatica</i> | Damabooti | 50 | |
| 76. | <i>Taxus wallichiana</i> Linn. | Thuner, Talispatra | 50 | |
| 77. | <i>Uraria picta</i> (Jacq.) Desv. | Prishnaparni | 50 | |

Plants eligible for 75% subsidy

| # | Botanical Name | Common Name | Eligible subsidy (%) | Remark |
|-----|---|-------------|----------------------|-----------------------------|
| 78. | <i>Aconitum ferox</i> Wall./A. balfouri | Vatsnabh | 75 | HA |
| 79. | <i>Aconitum heterophyllum</i> Wall. ex. Royle | Atees | 75 | HA |
| 80. | <i>Aquilaria agallocha</i> Roxb. | Agar | 75 | HA, LG, Endangered |
| 81. | <i>Berberis aristata</i> DC. | Daruhaldi | 75 | HA, Root |
| 82. | <i>Commiphora wightii</i> (Am.) Bhandari | Guggal | 75 | HA, Root |
| 83. | <i>Ferula foetida</i> Regel. | Hing | 75 | LG, Resin from base of stem |
| 84. | <i>Gentiana kurroo</i> Royle | Trayamana | 75 | HA |
| 85. | <i>Nardostachys jatamansi</i> DC | Jatamansi | 75 | HA, Rhizome |
| 86. | <i>Oroxylum indicum</i> Vent. | Syonaka | 75 | LG, Root |
| 87. | <i>Picrorhiza kurroa</i> Benth. ex Royle | Kutki | 75 | |

| | | | | |
|-----|--------------------------------|------------------------------|-----|----------|
| 88. | Podophyllum hexandrum Royle. | Bankakri, Indian podophyllum | 75 | HA, LG |
| 89. | Polygonatum cirrhifolium Wall. | Mahameda | 75 | |
| 90. | Pterocarpus santalinus | Raktachandan, Red sanders | 75 | LG, Wood |
| 91. | Santalum album Linn. | Chandan | 75 | LG, Wood |
| 92. | Saussurea costus C.B. Clarke | Kuth, Kustha | 75% | |
| 93. | Swertia chirata Buch-Ham | Chirata, Charayatah | 75 | HA |

HA - High Altitude

LG – Long Gestation

MG – Medium Gestation

SG – Short Gestation

Uni - Universal

Suggestions

The medicinal plants sector in the country has to address diverse issues to a large number of varied stakeholders, which comprise of both Government and Non government organizations (GOs & NGOs). Following are some of the stakeholders:

- i. Ministries and Deptts. of Government of India / State Govt, particularly Deptt. of Agriculture, Environment, Forests, Health and Commerce & Industries,
- ii. Traders and Manufacturers.
- iii. Collectors / Middle men and Cultivators / Growers of Medicinal plants,
- iv. Relevant NGOs engaged in various activities of the sector,
- v. Scientists / Researchers and Research Institutions and Laboratories,
- vi. Consumers - Commercial and non-commercial,
- vii. Ecosystem dependent communities — Traditional / Folk healers.
- viii. National / International organizational networks related with Medicinal plant sector.

Medicinal plants sector in India operates in **policy vacuum**. Immediate action is needed to regulate various components of the Sector including wild harvesting, conservation, cultivation, trade and marketing, domestic production etc. Immediate steps are required to be taken before it is too late.

In order to streamline the unorganized medicinal plant sector, there is a need, and responsibility of all the stakeholders, to act jointly in right direction. The GOs, NGOs and Corporate sector will have to make combined focused approach for streamlining and developing the sector in framing suitable policies, Planning and if necessary, amending the drugs and cosmetics act/ wild life acts or even introducing new legislatures. The National Medicinal Plants Board (NMPB) has to play a pivotal role for the development of the sector in all the spheres . Some of the suggestions are given here under:

1. NMPB and SMPB(State Medicinal Plants Board) has to be strengthen and given more power. A separate agency under NMPB consisting of representatives of three major players i.e. DoAYUSH, MoEF, Ministry of Agriculture could be constituted for policy framing implementation and regulation for medicinal plants sector.
- 2a. Need to have a separate medicinal plants Division or Cell in MoEF and in State forest departments, exclusively to monitor various activities, conservation measures, sustainable harvesting from the wild and transit of medicinal plants (NMPB intervention).
- 2b. Similarly, a separate agency or department for Medicinal Plants (MP) is needed in Agriculture ministry / State Agriculture department for Monitoring and addressing issues of MP cultivation all over the country (NMPB intervention).
3. Lack of coordinated approach - A need to avoid duplication/overlapping of schemes/projects and work related to MP, within and outside government departments like MoEF, DoAYUSH, DST and Min. Agri., DBT, Universities etc.
4. Implementation of the issues after modifications if required, recommended by the Task Force GOI, (2000) for the stakeholders like MoEF, Min. Agri. (ICAR), DoAYUSH, DoFW, DBT, DSIR, DST, Pharmacies and Medicinal Industries, NGOs.
5. Forceful and honest implementation of MP regulations and policies. To regulate prices and to reduce disparity between the prices of wild and cultivated raw materials.

6. Issues like : i. Policy and Institutional arrangements for sustainable utilization of MP. ii. Focus on environment and biodiversity conservation of different habitats, iii. Systematic cultivation of MP as per International norms, iv. Quality control and Standard finished products of MP v. Organizing market trade and exports, requires focused attention.

Other Important Issues

7. State-wise inventorisation of collectors (gatherers), growers, traders (agents) and manufacturers (category wise) of MP.
8. State-wise **registration** of collectors (gatherers), growers, traders (agents) and manufacturers (category wise) of MP.
9. Encourage cultivation of MP in a big way - like “ Green revolution”
10. Establishment of **network of monitoring agency** for end to end check on flow of MP.
11. Mechanism for **quality control** from sale (raw material), processing up to finished products for domestic and export purposes.
12. Harvesting **from wild** - The FD (MoEF) and State FD together with NMPB has to formulate a System and Regulations for wild harvesting of MP with a special reference to following issues:
 - i. Collection of MP, plant parts sustainably, region wise by identified agencies.
 - ii. Only authorized, registered, trained gatherers of identified agencies be allowed to collect MP.
 - iii. Cash payment of wages to collectors based on material, quantity etc. to avoid exploitation,
 - iv. End to End monitoring mechanism for harvesting, certification, transportation, storage, distribution and sale with a check at every level of supply chain up to the pharmacy.
 - v. For each and every collection of MP identity, source, quantity (plant part), period of collection/ expiry, collecting and transporting agencies including certificate from monitoring agencies should be mandatory,
 - vi. Only sealed or packed, certified harvested raw materials indicating above parameters be allowed for sale (mandatory),

- vii. The pharmacy should also have detailed record of source(s) material.
 - viii. Check on harvested MP material. Penalty for over exploitation of MP by act or law.
 - ix. Mechanism for conservation / regeneration of harvested material. The harvesting agency may be involved in the mechanism.
 - x. Monitoring flow and distribution of the harvested material to regulate prices.
13. Organize Trading community of the Medicinal plants sector and need to strengthen the regulations and linkages with Govt & Scientific organizations.

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