Journal of Advances in Science and Technology
Vol. 13, Issue No. 2, March-2017, ISSN 2230-9659

# An Analysis upon Various Challenges and Possibilities in the Development of Sustainable Medicinal Plant Resources in India

**Sangita Prasad[1]* Ratna Datta[2]**

[1]Research Scholar

[2]Assistant Professor

***Abstract – The use of medicinal plants is as old as human civilization. About 1,100 plants species are frequently used in Indian system of healthcare and medicines for preparation of ayurvedic, unani and homeopathic drugs. The economic value and future potential of the biological resources of a country are getting redefined in the wake of the newly emerging international trade regulations from a system, held over countries, where these resources were viewed as global heritages, they are now being treated as invaluable reserves for the future of the country with an untapped economic potential. Unlike that for physical resources, we do not have yet a system of defining 'biological resource holdings' of a country and consequently there is a greater chance of these resources leaking out to other countries even before their potentiality is realized by the host countries. Our country is among 12 leading biodiversity centres of the world with 45,000 plant species in 16 agroclimatic and 10 vegetative zones. We have 18,000 flowering plants, 44% of which are of medicinal significance. These medicinal plants are the richest resource of our traditional medicines, phytopharmaceuticals, modern allopathic drugs, household remedies and nutraceuticals. The use of phytopharmaceuticals is increasing at the rate of 15 percent annually. Global market is booming for MAPs and their products. Our contributions in the world market are not significant.***

***In recent years the demand for medicinal and aromatic plants has grown rapidly because of accelerated local, national and international interest, the latter notably from Western pharmaceutical industry. At present, resource-poor people in India's poorest state Uttaranchal collect plants from the wild in order to complement their meagre incomes. Due to continued collection and increasing market demand, numerous plant species are threatened with extinction. For rational and regulated collection, strong local communities or strict governmental control measures are necessary. High risks, transaction costs and lack of trust among chain actors prevent smallholder producers from taking up cultivation of medicinal plants. Public–private collaboration is suggested as a way of reducing these constraints and to secure market access to small producers. Such collaboration can provide a promising mechanism for establishing the conditions for the establishment of supply chains in the initial stages of development.***

----------♦----------

## INTRODUCTION

India is one of the world's top 12 mega diversity countries (Singh and Chowdhery 2002) with 10 biogeographic regions (Rodgers and Panwar 1990); in addition it has over 40 sites which are known for their high endemism and genetic diversity (Nayar 1996). Myers et al. (2000), in their updated list of world's biodiversity hotspots, included two from India. The climatic and altitudinal variations, coupled with varied ecological habitats of this country, have contributed to the development of immensely rich vegetation with a unique diversity in medicinal plants which provides an important source of medicinal raw materials for traditional medicine systems as well as for pharmaceutical industries in the country and abroad.

As a result of the increasing demand for medicinal plants, most of which is still met by wild collection, a constant pressure is created on existing resources, leading to continuous depletion of some of the species in the forests, and at the same time forest land is losing its natural flora at an alarming rate – 1.5 m.ha. every year – and what is left at present is only 8% against a mandatory 33% of the geographical area. Survey reports also show that supplies of some of the medicinal raw materials are running short in the pharmaceutical industries in India (Report of the Task Force: Tewari 2000). To control the situation, various

measures like commercial cultivation, habitat conservation, setting up of natural reserves, implementation of laws for restricting the export of plants (Rao et al. 2003), etc., have been taken up.

Resource development by cultivation and conservation of useful medicinal plants is, therefore, a matter of serious concern. Initiatives have been taken in this respect at various Government and non-Government sectors, and documentation of these works has become a necessary part of the programme. With rapid advancement in information technology, storage and retrieval of data using electronic devices are felt to be more useful than publishing in journals or books, because this helps in speeding up the searching process for relevant material.

In the present communication, an attempt has been made to present an overview of the activities on medicinal plants and their conservation that has been undertaken by major institutions/organisations in the country, and to discuss briefly about documentation and management of data generated in the field. With this objective in mind, a digital database has been developed incorporating data related to medicinal plants and their conservation in India. This database could also serve the purpose of establishing a nation-wide network among the people involved in similar work.

India has more than one fourth (8000) of the world's known medicinal plant species (30,000), of which 90% are found in forest habitats (Krishna Kumar and Katakam 2002). Along with the awareness of the need for biodiversity conservation, conservation of medicinal plants in particular is one of the most burning issues faced today in India. Through conservation, plant species are preserved and protected from various environmental hazards, including those caused by human interference. This process also allows a plant's natural regeneration in its own habitat. Conservation at the site where plants occur naturally, i.e., 'habitat conservation' or 'in situ conservation', is the most common method of conservation. In addition to this, with the help of advanced technologies applied in conservation research, cultivation of germplasms away from their original habitats has become a common practice. This method, known as 'ex situ conservation', has gained significant importance because it is used for safeguarding species that are at risk of destruction, replacement and genetic distortion. At present, about 10 million hectares, i.e., 4.5% of the geographical area of India, are under the in situ conservation programme (Singh and Chowdhery 2002) which includes setting up of biosphere reserves, sanctuaries, national parks, sacred groves and protected areas. The ex situ conservation programmes involve collection, preservation, multiplication and dissemination of economically important, endemic, rare and threatened species germplasms.

The medicinal plant sector in Uttaranchal, a Himalayan state in northern India, can provide an important source of income to the rural population, especially because returns from traditional crops are declining (Alam 2003). Uttaranchal's unique climate, its locally available expertise, motivated farmers and NGOs and a supportive government policy provide a strong base from which to take advantage of the growing national and international demand for medicinal plants (Belt et al. 2003; Alam and Belt 2004). The main advantage of medicinal plants for small producers lies in the fact that, compared to bulky and perishable commodities, they have a higher value per unit volume. This makes them particularly attractive for remote, mountainous areas with transport limitations.

In this paper, we analyse the opportunities for, and constraints on, developing medicinal-plant chains in Uttaranchal. The paper specifically aims to identify the role of medicinal-plant chains in poverty reduction; the basic conditions for successful integration of small producers in the medicinal-plant chain; and the institutional infrastructure required to support a pro-poor medicinal-plant chain. The paper is based on action research conducted by KIT Royal Tropical Institute, the Institute for Applied Manpower Research (IAMR) and the Centre for Sustainable Development (CSD). The study involved fieldwork and multi-stakeholder consultations to discuss research findings and identify pathways to the development of a pro-poor medicinal-plant chain.

## BACKGROUND OF THE STUDY

As much as 70 per cent of India's population use traditional medicine.2 The collection and processing of medicinal plants and plant products are a source of both full and part time employment in the country. Microstudies suggest that a large number of those employed in this sector are women. Medicinal plants are one of the most important components of the non-wood forest products sector which supplies over 80 per cent of India's net forest export earnings annually.

According to WHO, the international market of herbal products is estimated to be US $ 62 billion which is poised to grow to US $ 5 trillion by the year 2050, but India's share in the global export market of medicinal plants related trade is just 0.5 per cent. This indicates that production, consumption and domestic and international trade in medicinal plants based products is going to grow at a significant rate. For making full use of this potential, India must develop scientific cultivation, post harvest technology, processing, manufacturing, research and extension, patenting and marketing for medicinal plants. The small and poor growers of these plants, mostly located in hills, mountains and inaccessible places must also be made more involved with the processes of commercial production and marketing of these products so that they can increase their earnings and

are definitely not exploited.4 The state governments have to carry forward this task with great zeal.

Though economic importance of medicinal plants is well known, it is considered as a forestry sub-sector (nontimber forest products) in India. Till Medicinal Plants Board5 was constituted in year 2000, no nodal agency was there to look into medicinal plants as an 'economic sector' and different organisations were dabbling with different aspects of medicinal plants without any focus and co-ordination there by leading to paradox of simultaneous existence of under-utilisation and overexploitation.

Further, the lack of co-ordination has also led to critical research gap, that is, there is a regrettable absence of any research community working on socioeconomic and policy aspects of medicinal plants, such as that which exists with regard to agro-technology, biotechnology etc. In fact, scientists working in natural sciences themselves conducted socio-economic research in medicinal plants resulting in generally unprofessional analysis leading to over-simplification of complex issues and providing very general suggestions to tackle socioeconomic issues.6 Keeping in view this limitation, present study is designed to fill in the gaps in the understanding of various issues concerning medicinal plants sector.

## RESOURCE BASE, CONSERVATION AND UTILISATION

There are about 45,000 plant species (nearly 20 per cent of the global species) are found in the Indian Subcontinent. Of these, about 3,500 species of both higher and lower plant groups are of medicinal values. Of around 500 medicinal plant species used by the contemporary Ayurvedic industry, around 80 per cent are procured from wild areas, mostly notified as forest land.

Medicinal plants procured from cultivated private fields account for ten per cent of the total medicinal plants in active trade.8 The forests of Himachal Pradesh and the Western Ghats are known to supply a very large proportion of the medicinal plant requirements of India. Cultivation of medicinal plants at the farm level is one of the intervention being focused and tried to meet their ever increasing demand. The crucial point is that all medicinal plants cannot be cultivated because of their agro-climatic requirement specificity. Further, the effect of agro-climatic conditions on the chemical composition and therapeutic properties of medicinal plant species are well recognised and documented in Ayurveda.

Seasonal variation and age have a bearing on the composition of drugs. These factors limit the number of medicinal plants which are amenable for cultivation and extent to which it can be cultivated. On the other hand, technology and institutional arrangements influences which species are preferred for cultivation and who are going to grow them. Given these facts, there is an urgent need to assess priority species for future planning. Most important Indian medicinal plants have been identified on the basis of their medicinal importance, commercial value and potential for further research.

## ECONOMIC POTENTIAL

Several studies have clearly brought out the economic potential of medicinal plants in different agro-climatic conditions. The potential return to the farmers from cultivation of medicinal plants is reported to be quite high Researchers have estimated that the cultivation of certain high altitude Himalayan herbs could yield products priced anywhere between Rupees 7150 to 55000 per hectare13 and an average annual income of Rupees 120,000 per hectare through mixed cropping of high altitude medicinal herbs.14 Some low-altitude crops from the Amarkantak region of Madhya Pradesh showed substantial net returns for four profitable species – Curcuma angustifolia (Rupees 48000), Rauwolfia serpentine (Rupees 54000), Acorus calamus (Rupees 27000) and Chlorophytum tuberosum (Rupees 13000).

The foregoing review indicates that there are several studies touching various aspects of medicinal plants but only spherically. More research is needed for proper planning for conservation and utilisation of medicinal plants keeping in view their ecological and aesthetic values. Further, there was not a single study which addressed the issues in feasibility and viability of cultivation, marketing and trade and bio-prospecting issues in a holistic manner.

## DOCUMENTATION AND DIGITISATION OF INFORMATION ON MEDICINAL PLANTS IN INDIA

The worldwide increased activity in conservation, cultivation and use of medicinal plants towards the end of the past millennium is reflected in the magnitude of the work in this field, as evidenced by the information documented through published literature. Until the early 1970s, printed publications were the almost exclusive means available for recording and disseminating all scientific information (Bhatt 1995). But, with the developments in information technology and telecommunications, literatures are being presented to the media in the electronic format in addition to hard copies.

Now-a-days, a number of major journals have websites. Attempts have also been made

subsequently to pool and compile data from various sources and to present them in a comprehensive form. The databases thus developed are available to users through online vendors and CDROMs.

Digitization of information, i.e. development of electronic databases, is necessary in the study of medicinal plants for thorough understanding of important genetic resources. A large number of information sources is now accessible on the World Wide Web, providing comprehensive information on pharmacology, agriculture, management of natural resources, economic properties of the herbs, traditional herbal drugs, active ingredients, plant parts used, biological activities, therapeutic uses, chemical constituents, etc. (Sharma et al. 2002). While data on medicinal plant activities covering such a vast area have been computerised, information on conservation via the electronic media is limited and is in scattered form. However, information in this sector is necessary to all concerned in dealing with the development of sustainable alternatives to destructive harvesting and over-exploitation of useful medicinal plants. Several groups in India have, therefore, initiated activities in this emerging field. The Bioinformatics Centre of TBGRI has been organizing centralized online databases: 'Plant Info', provides data on endemic medicinal plants and trees of Kerala, 'Garden Info' contains data on plants conserved in TBGRI, and 'Seed Pack' is a database on the seed bank of TBGRI.

INMEDPLAN (Indian Medicinal Plants National Network of Distributed Databases) is an initiative network of several Indian organisations with expertise in different aspects of medicinal plants to build a multidisciplinary (botanical, horticultural, pharmacological and other) information pool by sharing their resources. The information is provided on request to the network secretariat at FRLHT, Bangalore. FRLHT's online databases are 'Encyclopedia of Indian Medicinal Plants' containing details of around 7361 plant species and 'Medicinal Plant Conservation Concern', focusing on 880 species of traded medicinal plants of India.

National Institute of Science Communication & Information Resources (NISCAIR) has developed a computerised version of the bimonthly abstracting journal, The Medicinal and Aromatic Plant Abstract (MAPA). The data from 1988 onwards (about 30,000 records) are held in electronic form and distributed in CDROMs. CDRI, Lucknow has developed the Natural Products Database, NAATS, which contains factual information on medicinal plants.

Detailed data on botanical characters, collection site details, pharmacological screening results, chemical structures of active constituents, uses in folk medicine and in established traditional medicine are provided. Central Institute of Medicinal and Aromatic Plants CIMAP) has developed databases – REFMAP (References on Medicinal and Aromatic Plants) and MAPI (Major Aromatic Plants of India) – having compiled and collated information on medicinal and aromatic plants.

Recently, BSI has set up a number of computer centres in their regional circles with the objective of developing a computerised National Data Base for systematic storage and retrieval of data related to herbarium collections, live collections, plant genetic resources, plant distribution and nomenclature. The Southern Circle at Coimbatore has a mainframe computer and PCs mainly engaged in data-basing of National Flora and Type collections. The computer centre at North Circle, Dehradun, has established a computerised database on medicinal plants. The Environmental Information System (ENVIS) Centre on Floral Diversity of BSI, Kolkata, has developed the databases 'COBOMAN' for input of data on rare and threatened plants of India, 'Medicinal Plants' for providing information on important medicinal plants, and 'CITES Plants' which provides information on plants which are restricted for export.

## METHODS

A range of primary and secondary sources were used. The primary sources derive from two sets of surveys: surveys of the floristic diversity of protected areas; and extensive and intensive field surveys conducted from January 2004 to September 2006. Extensive surveys covered most of the state while the intensive surveys were conducted in 15 biodiversity-rich areas in tropical and subtropical (< 1800 m), temperate (1801–2800 m), subalpine (2801–3800 m) and alpine (> 3800 m) zones of Kullu, Lahaul and Spiti, Mandi, Shimla, Bilaspur, Solan, Sirmaur and Kangra districts. Several visits were made to each of the intensive survey sites in different seasons.

During the intensive surveys, local knowledgeable persons from each of the sites were interviewed and information on indigenous uses of the medicinal plants was collected. One such person from each site was hired to collect samples of medicinal plants from the natural habitats. Fresh samples of each species were collected and identified with the help of local flora (Singh and Rawat 2000; Kaur and Sharma 2004). Information on altitudinal range, part(s) used, life forms and indigenous uses was collected during the surveys.

The secondary sources include a study of the flora of the Great Himalayan National Park and literature on the medicinal plants of Himachal Pradesh (Samant and Pant 2006; Samant et al. 2007). For nomenclature and nativity of the species, Anonymous (1883–1970) and Samant et al. (1998) were followed. Endemism of the species was assessed based on biogeographical distribution: species restricted to the IHR were identified as endemic, while those species also found in adjacent countries were identified as near-endemic (Dhar and Samant 1993; Samant et al.

1998). Rarity categorization is based on Samant et al. (1998), Dhar et al. (2002), and Ved et al. (2003). The prioritization of species for cultivation in each altitudinal zone was determined according to medicinal uses (Ved 2001), availability (based on the primary surveys carried out in the state), trade values (Sultan and Singh 2006), demand in local, national and international markets and pharmaceutical preparations (Ved 2001) (Table 1).

| Himachal Pradesh | | | | | |
|---|---|---|---|---|---|
| *Score* | *Medicinal uses* | *Availability* | *Trade values* | *Demand* | *Pharmaceutical preparation* |
| 10 | > 15 | High | High | High | > 150 |
| 6 | 5–15 | Moderate | Medium | Medium | 50–150 |
| 2 | < 5 | Low | Low | Low | < 50 |

**Table 1 Criteria used for prioritization of the medicinal plants for cultivation in Himachal Pradesh.**

## CONCLUSION

The importance of the medicinal plants sector can be gauged from the fact that herbal medicines serve the healthcare needs of about 80 per cent of the world's population. According to the World Health Organisation (WHO), the goal of 'Health for All' cannot be achieved without herbal medicines. While the demand for herbal medicines is growing in developing countries, there are indications that consumers in developed countries are becoming disillusioned with modern healthcare and are seeking alternatives. Herbal medicines occupy a vital sector of health care system in India and medicinal plants represent a major national resource. It is important to ensure their conservation for sustainable utilization.

## REFERENCES

Alam, G. (2003). IPRs, access to seed and related issues: a study of the Central and North-Eastern Himalayan region. Centre for Sustainable Development, Dehradun.

Alam, G. and Belt, J. (2004). Searching synergy: stakeholder views on developing a sustainable medicinal plant chain in Uttaranchal, India. KIT Publishers, Amsterdam. KIT Bulletin no. 359. [http://www.kit.nl/net/KIT_Publicaties_output/showfile.aspx?a=tblFiles&b=FileID&c=FileName&d =TheFile&e=605]

Belt, J., Lengkeek, A. and Van der Zant, J. (2003). Cultivating a healthy enterprise: developing a sustainable medicinal plant chain in Uttaranchal-India. KIT Publishers, Amsterdam. KIT Bulletin no. 350. [http://www.kit.nl/publishers/assets/images/isbn9068328395_com leet.pdf]

Bhatt K.K.S. (1995). Medicinal Plant Information Databases. Non-wood Forest Product FAO – Food and Organisation of the United Nations, Viale dells di Caracalla, 00100 Rome, Italy.

Bhatt R.C. (2002). Farmers are ready to cultivate medicinal, aromatic and other economic species in Uttaranchal. MFP News XII: pp. 13–14.

J. Holley and K. Cherla (1998). The Medicinal Plants Sector in India (New Delhi: International Development Research Centre).

Kaur H. and Sharma M. (2004). Flora of Sirmaur (Himachal Pradesh). Dehradun: Bishen Singh Mahendra Pal Singh.

Krishna Kumar A. and Katakam A. (2002). Credit for conservation. Frontline 19: pp. 9–22.

Myers N., Mittermeier R.A., Mittermeier C.G., daFonseca G.A.B. and Kent J. (2000). Biodiversity hotspots for conservation priorities. Nature 403: pp. 853–858.

Nayar M.P. (1996). Hotspots of Endemic Plants of India, Nepal and Bhutan, Thiruvananthapuram, TBGRI. Vedams eBooks, New Delhi, India.

O.G. Goswami and P. Bhatnagar (1990). 'Economic Returns from Cultivation of Medicinal Plants in Amarkantak', 14 (3) Vaniki Sandesh.

R. Gupta (1997). 'Conservation and Utilisation of Indian Medicinal Plants', 6(2) Indian Journal of Plant Genetic Resources 131 (1993) and see Foundation for Revitalization of Local Health Traditions, Medicinal Plants of India: Guidelines for National Policy and Conservation Programmes (Bangalore: Foundation for Revitalization of Local Health Traditions).

Rao C.K., Geetha B.L. and Suresh G. (2003). Red list of Threatened Vascular Plant Species in India. Director, Botanical Survey of India, ENVIS Centre for Floral Diversity, Botanical Survey of India, Central National Herbarium, Indian Botanic Garden, Howrah (India).

S. Niraj, Meera Iyer and Ram Prasad (2002). The Ayurvedic Medicine Industry: Current Status and Sustainability, Sub Study of the India Country Study of the International Collaborative Research Project on Instruments for Sustainable Private Sector Forestry (New Delhi: Ecotech Services (India)

Pvt. Ltd. and International Institute for Environment and Development, London)

Samant S.S., Butola J.S. and Sharma A. (2007). Assessment of diversity, distribution, conservation status and preparation of management plan for the medicinal plants in the catchment area of Parbati Hydro-Electric Project Stage III in North Western Himalaya. Journal of Mountain Science; 4(1): pp. 34–56

Samant SS and Pant S. (2006). Diversity, distribution pattern and conservation status of plants used in liver diseases/ailments in Indian Himalayan Region. Journal of Mountain Science, 3(1): pp. 28–47

Sharma A., Dwivedi N. and Khanuja S.P.S. (2002). Sourcing information on R&D and trade of medicinal and aromatic plants through web data mining: some utility sites. Journal of Medicinal and Aromatic Plant Sciences 24: pp. 82–103.

Singh N.P. and Chowdhery H.J. (2002). Biodiversity conservation in India. In: Das A.P. (ed.), Perspective of Plant Biodiversity. Department of Botany, North Bengal University, West Bengal, India, pp. 501–527.9–11 November 2000, Bishen Singh Mahendra Pal Singh, Dehra Dun, India.

Singh SK and Rawat GS. (2000). Flora of Great Himalayan National Park; Himachal Pradesh. Dehradun: Bishen Singh Mahendra Pal Singh.

Tewari D.N. (2000). Report of the Task Force on Conservation and Sustainable Use of Medicinal Plants, Government of India Planning Commission.

**Corresponding Author**

**Sangita Prasad***

Research Scholar

**E-Mail –** rahanulabedin23@gmail.com