

Cultivation of medicinal plants and its contribution to livelihood enhancement in the Indian Central Himalayan Region

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ABSTRACT

This article examines the potentials of cultivating medicinal plants and its contribution to livelihood enhancement in the Indian Central Himalayan Region. Here, medicinal plants have been growing traditionally and have been used through local health care system for the centuries. Until now, the production from the traditionally grown medicinal plants is considerably low. Meanwhile, the agro-ecological conditions in this region are very conducive for growing large-scale medicinal plants. Recently, the Government started cultivating medicinal plants in the mid-altitudes and the highlands through establishing poly-houses and providing them to the native farmers of the region. As a result of this, the farmers of the mid-altitudes and the highlands villages followed Government initiatives quite enthusiastically. However, lack of transportation facilities and unavailability of market still remains a major hurdle for the producers of medicinal plants. They do not get the actual returns from the products timely and adequately. Therefore, the pace of cultivating medicinal plants is slow. As medicinal plants require about two years to grow and turn into a complete product, it needs smooth market functioning and other infrastructural facilities, in spatial and temporal perspectives. This study was based upon the collection of primary data, which were gathered through participatory observation method and interview of the farmers and extension workers, involved in the cultivation of medicinal plants, after rapid field visit.

Keywords: Conservation, medicinal plants, livelihood, agro-climate, Indian Central Himalayan Region.

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INTRODUCTION

The Indian Central Himalayan Region (ICHR) is endowed with a wide and rich spectrum of biodiversity resources. It is recognized as one of the world's top 12 mega biodiversity regions, and possesses rich flora that includes about 45,000 species. Many of them are accredited with medicinal values. There are many local health care systems which prevail in the ICHR, and they are called classical Indian systems of medicines. The species used for various systems of medicines are Ayurveda-1200, Siddha-900, Unani-700, Amchi-600, and Tibetan-450 (Anthwal, 2006a; Sati, 2012a). Medicinal plants (MPs) grow naturally in the forest area and about 95% medicinal plants are collected from the wilder area. The process of collection is distractive because of the use of parts like roots (29.6%), leaves (25.8%), barks (13.5%), wood (2.8%), rhizome (4%), and whole plants (24.3%).

Vegetation types categorize from the tropical deciduous to the alpine pastures and most of them are utilized as medicinal plants. Many floral species are vulnerable to extinct. It has estimated that over 350 species of plants are vulnerable in this region, out of which, 161 species belongs to rare and threatened categories (Pondhani et al., 2011). In the ICHR, vegetations are considered as rich source of medicinal plants; however, various factors such as habitat destruction, over and illegal exploitation, changing climate etc, decreased the availability of MPs in the wild (Maikhuri and Sinha, 1998).

The State of Uttarakhand is located in the ICHR, and was declared as an 'Herbal State' in 2003. Following declaration, the State Government started cultivating MPs in the suitable agro-climatic zones, that is, the mid-altitudes and the highlands. The poly-houses (Figure 1)



Figure 1. Medicinal plant (*Geranium*) grown in the poly-houses in a bio-village near Gwaldom.

were given to interested native farmers of the region. They were provided financial assistant to grow MPs in the poly-houses. There are thousands of medicinal species found mostly in the mid-altitudes and the highlands. The State Forest Department claims to have knowledge of about 175 species, which are being commercially extracted and traded. However, the State could not harness the available species of MPs optimally. According to estimation, about Rs. 100 million (Rs. denotes the Indian currency) can be generated per annum through this practice.

Study area

The ICHR is located in the centre of the Himalayan Mountain Range, also known as the Uttarakhand Himalaya. It comprises of the two distinct geographical entities, that is, Garhwal and Kumaon Himalayas, and is delimited by Himachal Pradesh in the northwest, Haryana in the west, Uttar Pradesh in the south, Nepal in the east, and Tibet in the north (Figure 2). Characterized by undulating and precipitous terrain, the ICHR is vertically divided into three divisions – the Great Himalaya, the Middle Himalaya and the Lesser Himalaya, with altitudes varying from 200 m to above 7000 m. Out of the total geographical area (51125 km²), 92.6% is mountainous, which is called mainland. Agro-climatic conditions are quite suitable for the cultivation of medicinal plants, as agro-diversity is considerably high in the highlands. The mid-altitudes, the highlands, and the alpine meadows are

the potential areas where medicinal plants are naturally grown and cultivated as well.

This study was carried out through collection of primary data using participatory observation methods and interviews. Medicinal plants gatherers and extension workers involved in herbal department were interviewed in regard to conserve medicinal plants. The main question was raised during the study that what are the potentials of medicinal plants and how can they be conserved in the ICHR to livelihood enhancement and biodiversity conservation.

MAJOR TYPES AND USE PATTERN OF MEDICINAL PLANTS

Plants

Plants used for medicinal purposes throughout the world are clubbed under the category of MPs. According to WHO, 'a medicinal plant is any plant which, in one or more of its organs, contains substances that can be used for therapeutic purposes, or which are precursors for chemo-pharmaceutical semi-synthesis'. The major sources of MPs were those grown naturally in the highlands and the alpine meadows and collected during the past decades. But now, MPs are being cultivated in many parts of the ICHR. Meanwhile, the proportion of cultivated MPs is tremendously low in comparison to naturally grown MPs. The wild harvesting includes the plant material as herb (plant above ground), folia (leaves),

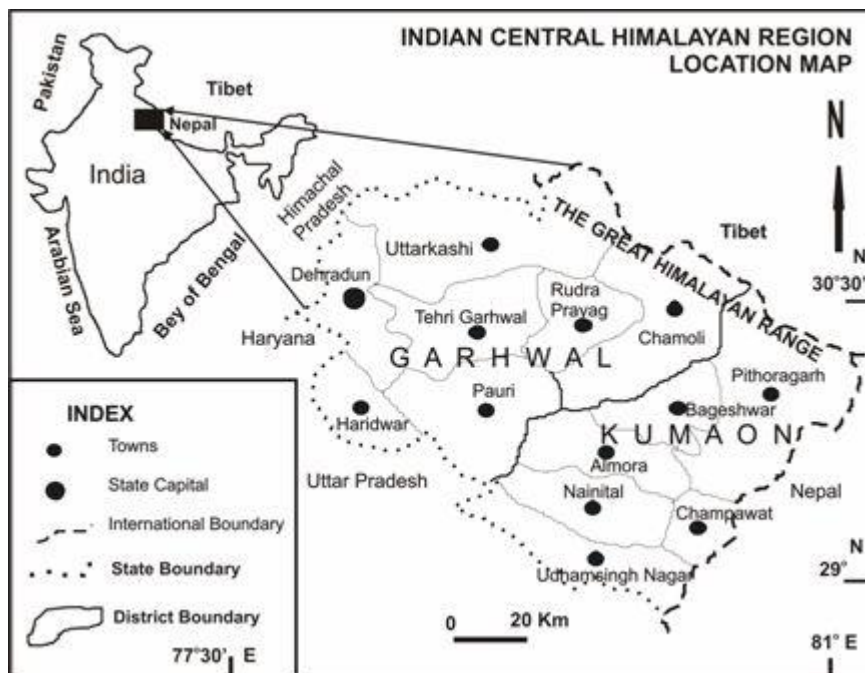


Figure 2. Location Map of the Indian Central Himalayan Region.

lignum (wood) and radix (roots).

Aromatic plants

They are essential oil yielding plants and have volatile, odoriferous oils in special cells, glands or ducts located in different parts of a plant, such as the leaves, barks, roots, flowers and fruits and sometimes in just one or two parts. The oils are usually present in very small amounts and comprise only a tiny fraction of the entire plant material. The oils are produced during some metabolic processes of the plant and are secreted or excreted as odoriferous by-products. The fragrant oils may not necessarily be present as such in the living plants but may occur as odorless compounds called glycosides. When the plant tissues are macerated, an enzyme reaction occurs, these causes the glycosides to undergo a chemical change. This action in turn liberates the distinctive essential oil.

Sacred groves

Traditional societies all over the world value a large number of plant species from the wild for variety of reasons such as for food, fiber, shelter and medicine. The practice of conservation of plant species in the ICHR is time immemorial. Here, the people have a rich tradition of nature conservation. Sacred groves (Table 1) are one of the first instances of it, which are worshiped in different forms at the various occasions. Nature worship has been

a key force of shaping human attitudes towards conservation and sustainable utilization of floral resources. Such traditional practices have been invariably operating in the entire ICHR.

TRADITIONAL CULTIVATION PATTERN AND PRESENT POTENTIALS OF MEDICINAL PLANTS

Worldwide, it is estimated that up to 70,000 species are used in folk medicine. The WHO reports over 21,000 plant taxa used for medicinal purposes (Groombridge, 1992). Presently, there is no idea how many species are used in the other proposes. However, it is stated that at least every fourth plant is in use, a calculation based upon the estimated total number of 350,000 flowering plants. The numbers of MP species used in some regions are very impressive. In India, which is known as the oldest, richest and most diverse cultural traditions in the use of medicinal plants, about 7,500 species are used in ethno-medicines (Shankar and Majumdar, 1997a), which is near half of the country's 17,000 native plant species. In south and Southeast Asia, the Ayurveda, Unani and Siddha medicines are widely distributed, and most of them are native to Indian plant species (Shankar and Majumdar, 1997b). MPs are selected for a notable livelihood-focused venture along with traditional farming system in India, which can generate regular income to farmers (Uniyal et al., 2000). India has the highest number of MPs that are cultivated and grown naturally. Out of over 15,000 species used in different systems of health care in Asia, 7,000

Table 1. List of sacred plant species of the ICHR.

Scientific name	Vernacular name	Beliefs/Uses
<i>Emblica officinalis</i>	Amla	Sacred tree
<i>Aegle marmelos</i>	Bail	Sacred plant
<i>Musa paradisiaca</i>	Banana	Used in rituals
<i>Ficus benghalensis</i>	Bargad	Sacred tree
<i>Cedrus deodara</i>	Deodar	Sacred tree
<i>Artemisia spp.</i>	Dhoop or Kunju	Used in rituals
<i>Cynodon dactylon</i>	Doob	Used in rituals
<i>Mangifera indica</i>	Mango	Used in rituals
<i>Azadirachta indica</i>	Neem	Sacred tree
<i>Quercus spp</i>	Oak	Sacred tree
<i>Prunus cerasoides</i>	Paiya	Used in rituals
<i>Ficus religiosa</i>	Peepal	Sacred tree
<i>Pinus roxburghii</i>	Pine	Used in rituals
<i>Xanthoxylum achanthopodum</i>	Timroo	Sacred tree
<i>Ocimum sanctum</i>	Tulsi	Sacred herb

Source: Adopted from Anthwal (2006).

species are found in China and 8,000 in India (Negi et al., 2010).

In fact, the sacred ICHR, popularly known as *Dev Bhumi* (abode of God), is widely believed to be the source of the centuries old traditional system of medicine called Ayurveda. The indigenous people of the ICHR have a rich local health traditions and a large number of traditional healers have been practicing indigenous medicine for centuries (Bodeker, 2000). Here, cultivation of MPs has become a considerable source of livelihood for rural inhabitants. MPs are also in great demand by the pharmaceutical industries based on the Indian medicine system. At present, medicines of vegetative origin are also prepared in the Homoeopathic system.

In the past, MPs collection was a subsidiary activity when the native people migrate to the highlands to graze their livestock (Sati, 2008). Along with grazing livestock, they collected MPs and largely used them for the local health care. There is a long history of collection and cultivation of medicinal plants in the ICHR. The Bhotia community people were involved in trading MPs mostly to Tibet and surrounding villages. During the 1980's, the government granted permission to individuals or contractors to collect it for trading. Contractors employed outside labour rather than local people. The local people strongly opposed this policy, partly because they did not get any direct benefits and because of the threat to their livelihood due to unsustainable harvesting by the outside labour. Due to strong opposition from the people, this practice was terminated in 1988. Currently, the State Forest Department has prioritized eleven medicinal species viz. *Aconitum heterophyllum*, *Lemongrass*, *Citronella*, *Basil*, *Geranium*, *Palma Rosa*, *Jamarosa*, *Tagetus*, *Chamomile*, *Stevia* and *Rose*.

The cultivation technology for some species have been

perfected and employed in the field. Using seeds stem and root cutting does domestication of some species. Another initiative has been raising of seedlings of tropical, temperate and alpine species. Seedling availability also differs from 2001-2002 to 2004-2005. It was 500,000 in 2001-2002 to 4,289,968 in 2004-2005. Region-wise, circle-wise, division-wise and species-wise, seedlings were done during the periods. Institutionalization and switching over of marketing of MPs from Bhesaj Sangh has been another initiative. In terms of distribution of MPs by their habit in ICHR, trees obtain highest rank as it occupies 33% of the area, followed by herbs (32%) and shrubs (20%). Area under climbers is 12% and others are 3%. The present potential of medicinal plant is tremendously high because of huge diversity in the floral species from sub-tropical to alpine. If it is cultivated sustainably, it will manifest to enhance livelihood of the people of ICHR.

CONSERVATION INITIATIVES FOR SUSTAINABLE CULTIVATION OF MEDICINAL PLANTS

After declaration of Uttarakhand as an Herbal State, the government took initiatives for sustainable cultivation of MPs in a phased manner. The government appointed Agriculture and Processed Food Products Development Authority, as a nodal agency to promote setting up of Agri Export Zones in two phases. Under the first phase, six districts: Chamoli, Dehradun, Haridwar, Pithoragarh, Udham Singh Nagar and Uttarkashi, are being covered. In this phase, emphasis on 10 high value species as mentioned above will be cultivated on about 500 ha land. In the second phase, the area under cultivation would be increased and additional districts brought under the aegis

of Agri Export Zones and other medicinal plants will also be cultivated. This is being done with the support from Infrastructure Development Finance Company Ltd to boost exports and enhance India's share in the world market. The State has established the Herbal Research and Development Institute at Gopeshwar in district Chamoli as a nodal agency to monitor developmental issues and for inventorization of MPs species in the state.

However, conservation of MPs has always been a prominent task in the ICHR. Most of the species (about 95%) are found wild in the forests. The forest management has traditionally been timber oriented and tree centric. Due to ease in collection, the tree species of MPs got impressive position compared to herbs and shrubs species. Traditionally, the native people including Bhotia tribe has been cultivating MPs for their livelihood. Recently, the cultivation of medicinal plants was started in the whole region, mostly in the mid-altitudes and the highlands. Cultivation of herbs mainly kutki and kut (*Aconitum heterophyllum*) has largely been carried out in Ghaise village of Tharali taluk. This was done with the help of the High Altitude Plant Physiology Research Centre (HAPPRC), Garhwal University Srinagar Garhwal. About 25 households (HHs) benefited cash of Rs. 87,000 during 2007-2008. Initially, 32 HHs was involved with this practice but 7 HHs withdrew because of delay in payment. With the interference of HAPPRC, the payment was made (Sati, 2012b). The ICHR obtains 92.6% of mountainous area, where subsistence agriculture is the main occupation of the people. Owing to limited agricultural land (12%) and low production and productivity of crops, the entire region is economically backward. It is noteworthy that cultivation of medicinal plants will raise the income of the people and will also be a major source of livelihood.

DISCUSSION AND CONCLUSIONS

Medicinal plants occupy an important position in the socio-cultural, spiritual and medical arena of the rural people of India. According to estimation, about one and a half million practitioners of Indian System of Medicine and Homeopathy (ISM and H) use medicinal plants in preventive, promotive, and curative applications. There are about 460,000 registered practitioners of ISM and H who use medicinal plants in the codified streams. Besides, there are also 7,843 registered pharmacies of ISM and 851 Homeopathy and a number of unlicensed small scale units. About 3500 species are estimated to be used in human and animal health care, but the pharmaceutical industries have concentrated in about 700 plant species. Many of them have been assessed critically endangered and put under legal protection.

According to the estimates of World Health Organization (WHO), 80% of population of the developing countries depends mostly on plant drugs for their primary

health care. Developing countries are the leading suppliers of medicinal plants. In the ICHR, MPs play a significant role in the subsistence economy of the people, especially those living in the mid-altitudes and the highlands. The collection, simple processing and trading of medicinal plants contributes significantly to the cash income of the marginal farmers in this region. A recent study carried out by CECI India (Regmi and Bista, 2002), indicated that from a single district of Pithoragarh, a district of the ICHR, more than 1300 tons of MPs are collected and traded annually, but the practice was done illegally.

IUCN, WHO and WWF (1993) found out that the cultivation of medicinal plants is the best and promising way to satisfy the market's expanding demand for these raw materials. However, up till now, cultivation has not proved to be profitable for the majority of taxa in trade (Lange, 2001) because: (1) Many plants are difficult to cultivate, (2) to take a plant into cultivation, if possible, will often last many years, (3) many plants are only required in small quantities, (4) in some cases the quality of wild-harvested material is supposed to be superior, and (5) the costs for wild-crafted plant material is in general lower than for cultivated material (Lange, 1997). The similar case implies with the marginal farmers of the ICHR. Owing to the lack of transportation and market facilities, the products from medicinal plants do not get sufficient benefits. As a result of this, marginal farmers largely prefer cultivation of traditional subsistence crops.

Medicinal plants have the potential to fill livelihood needs as they provide green health alternatives and a number of other eco-friendly products of domestic and industrial usage (Tempesa and King, 1994). In the ICHR, MPs grow in the wild as natural component of vegetation. Due to informal supply chain, over exploitation, population pressure, unsustainable practices and biodegradation, this traditional base of livelihood is shrinking. There are restrictions on extractions of MPs by the Government therefore, over extractions and trade is going on secretly which is leading to unsustainable practices. In the absence of scientific system of collection and fostering regeneration of such plants, several species have been endangered and extinct e.g., *Nardostachys jatamansi* and *Aconitum* species. This is serious depletion of MPs causing loss of biodiversity of resource areas. No effective measures so far have been attended by the Government and the researchers towards the sustainable management of MPs in the State. Further, by the advent of modern industry and influence of western cultures, the ancient ethics of traditional practices have changed. Increasing threats to biodiversity loss, demands new conservation approaches enabling fair share of the wider values of conservation to the local communities and positive local attitudes towards conservation goals. With emphasis, it can be stated that the ultimate solution of medicinal plant conservation is medicinal plant cultivation in a scientific way (Foster,

1993). There must be prevailed a sustainable management planning for conservation and protection of MPs and a smooth marketing system.

Collection of raw materials and consumption patterns of medicinal plants vary from one region to other. Raw materials of different medicinal plants should be harvested during proper time of season; at proper stage of developmental growth keeping in view its correlative relationship with plant and its organs. Professional doctors from tribal areas, in general, select the time and seasons for collection of medicinal plants depending on the parts used (Pal and Jain, 1998). In addition, there is a socio-economic aspect which supports future wild-collection that may be an additional income of the poor rural people. However, the highly demanded MPs are those that need immediate conservation measures. Per capita annual consumption of drugs in India is about Rs. 125, which is the lowest in the world because the majorities consume medicinal plants as basic health care resources. The demand for medicinal plants in India – to meet both domestic and export market - comprising 162 species, is expected to increase at about 15 to 16% between 2002 and 2005 (CRPA, 2001a). The annual turnover of three of the major Indian systems of medicine, that is, Ayurveda, Unani and Siddha is estimated to be more than half a billion dollars. The current gap between demand and supply is estimated to be 40,000 to 200,000 tons, which is expected to rise to 152,000 to 400,000 tons by 2005 (Planning Commission, 2000; CRPA, 2001b).

The urgency and need to protect the fast disappearing medicinal plants-based traditional knowledge, which is still abundant in the highlands, cannot be overemphasized. MPs cultivation and management therefore, can become highly remunerative both in financial and economic terms for the small-scale growers. All forms of vegetation in the sacred groves are supposed to be conserved (Vartak and Gadgil, 1973). However, little information is available on sacred groves and its conservation in the ICHR. In many cases several threat factors intensify the overall threat to a species. There are an increasing number of publications reporting on the shortage in natural resources of many medicinal and aromatic plants all over the world (Jain and Sastry, 1980; Fuller, 1991; Cunningham, 1997; He and Sheng, 1997; Lange, 1998, 2001; Bajaj, 1999; Robbins, 1999; Bhattarai et al., 2002).

Potentials and prospects for cultivating MPs in the ICHR are high. However, the pattern of cultivating them is traditional. Modern innovation in this field could not get footings due to many reasons. Among them, lacking in government initiatives, lacking in market and other infrastructural facilities like transportation, inaccessibility of MPs growing areas, and over and under utilization are prominent. Meanwhile, livelihood enhancement can be ensured through cultivating MPs in this ecologically fragile terrain. This practice can thoroughly be done in the ICHR as agro-climatic conditions are quite suitable. All

three vertical zones, such as mid-altitude, highlands, and alpine meadows, are very conducive for growing MPs. The state Government and the authorities working in this filed, should ensure smooth functioning towards sustainable cultivation of MPs. People participation must be ensured so that the real benefit will go to poor mountain people. Declaration as 'Herbal State' has necessitated to defining the operational, functional mechanisms, and formulating action plan for sustainable development of MPs in the ICHR.

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