

Supply of Herbal Raw Drugs from Wild Collections

Wild/self grown plants from forests and from habitats outside forests (agricultural farms, fallow lands, road/ rail sides, canal banks, ponds and lakes, waste lands) form the major source of supply of a large number of herbal raw drugs. Thousands of rural and forest-side people act as wild gatherers from these habitats with the primary objective of generating for them cash income. The material so collected from the wild enters the trade to meet the demands of end users. With commercial demand for many of the wild collected species on the rise, the natural populations of many species have undergone drastic reduction. 344 native medicinal plant species of India have already been assessed as Red-Listed at regional, national or global level through rapid threat assessment exercises across the country. Wild collections from non-forest habitats have always been free with no agency maintaining record of such harvests. With most of the states having devolved the rights over minor forest produce, including medicinal plants, to the local Panchayats, the concerned forest departments have now done away with the system of maintaining records of wild harvests even from the forests. The situation calls for immediate amends. It needs to be appreciated that annual wild harvest data is of paramount importance for species-specific management interventions. Initiatives towards long-term conservation of threatened medicinal plants are also needed to be upscaled and systems put in place for periodic monitoring and evaluation of the impacts of conservation efforts.

5.1. INTRODUCTION

Wild/self grown medicinal plants remain the major source of botanical raw drugs supplies to meet the commercial demands of the material on one hand and to form a source of cash income to thousands of wild gatherers in the country on the other. More than 60% of the 310 medicinal plant species recorded in high trade (>100 MT per year) under this study are sourced from the wild i.e. from forests and from habitats outside forests (agricultural farms, fallow lands, road/ rail sides, canal banks, ponds and lakes, waste lands). Most of the herbal raw drugs sourced from the high-Himalayan medicinal herbs, and trees and other long gestation medicinal plants are collected from the wild.

Generally, it is the local communities that undertake wild harvest, with more than 50% of the wild gatherers being women. The wild collection is usually dependent upon the market trigger by large traders that informally announces the demand of a particular material for the year. The word about the requirement of traders spreads by word of mouth, mainly by aggregators/ traders/ commission agents working in different layers of trade web. At the community level, wild harvest is seen as an opportunity to earn cash income and has, therefore become highly individualistic activity with 'before my neighbour and more than my neighbour' as the major collection motto (Ved and Goraya, 2008a). This competitive wild collection invariably leads to destructive harvesting, and has put wild populations of many medicinal plant species under severe stress. Species like *Fritillaria roylei*, *Trillidium govanianum*, *Ophiocordyceps sinensis*, etc. are already on the brink of extinction due to destructive wild collections. This practice is at variance with the 'time tested community based traditional sustainable wild collection practices of going in for wild collections during designated periods only'. Such time tested sustainable wild collection practice was manifested in the observance of bees bhadon (20th of 'Bhadon'- a month as per Indian calendar corresponding to about mid-September) as the day to initiate wild harvests in Himachal Pradesh. Local people on this day would first pay obeisance to the local deity and only then proceed to the alpine meadows for wild collection. 'This practice not only ensured maturity of the officinal parts and shedding of seeds, it also ensured a collective check on over-harvests' (Goraya, 2014).

Interactions with wild gatherers, traders and end users bring out that the supplies of herbal raw drugs from this very important natural resource are on the decline. In fact, availability of some herbal raw drugs had become so scarce that the traders and users were constrained to increasingly rely upon the 'equivalents' and 'substitutes' for the original raw drug. The scenario calls for immediate management interventions to conserve and build the wild populations of priority species, i.e. the species in high demand and the species that have become 'threatened'. Such management intervention would require data in respect of annual harvests of different species from the forests and habitats outside forests. However, the practice of maintaining record of wild harvests from forests has been discontinued by many state forest departments after devolving control over minor forest produce, including medicinal plants, to local communities. It is only in respect of a few high volume medicinal plant species that have been 'nationalised' by some states that harvest records are maintained now.

5.2. STATUS OF MAINTENANCE OF WILD HARVEST RECORDS BY STATES

An estimated 80% of the medicinal plant species diversity in annual commercial demand is sourced wholly or partially from the wild from both the forest and non-forest landscapes. It includes a large number of species in high annual demand.

5.2.1. From Forests: The State Forest Departments being custodians of forest lands should be maintaining record of wild harvests from the forests. However, it is not so and the practice of maintaining record of species-wise annual harvest of herbal material from forests being followed by the state forest departments till about 2003 seems to have been discontinued by many states. The states of Madhya Pradesh and Chhattisgarh maintain record of annual removals in respect of only a few 'nationalised' species. The communities in these states have been given the rights to freely collect and trade all medicinal plant species other than the 'nationalised' ones without the need for procuring 'transit passes' from the forest department. The states of Uttarakhand and Gujarat have made the State Forest Corporations as the nodal agencies for trading wild collected medicinal herbs. Whereas Uttarakhand Forest Corporation trades all the herbal material that is brought to its three designated depots by the agencies authorized to undertake wild harvest, the Gujarat Forest Corporation trades in the listed species through its depots.

Many other states have devolved the rights over minor forest produce, including medicinal plants, to the local communities and have delegated to the concerned Panchayats the powers to issue export permits for the wild collected herbal produce. However, the necessary mechanisms to collate Panchayat data about the collection and trade of medicinal herbs at the states level is yet to be put in place.

During the current study, data with respect to wild harvest of medicinal plants could be gathered from only 7 states and 2 Union Territories. The States of Delhi and Goa and the Union Territories of Chandigarh and Dadra & Nagar Haveli have reported 'Nil' removals of medicinal herbs over the last three years. Data received from the other 5 states is tabulated below:

Table 5.1. State-wise data of Annual Harvests of Medicinal Plants from Forests for the year 2014-15

S. No.	Species	Local Name	Parts Harvested	Quantity Harvested in 2014-15 (in qtls)				
				Maha-rashtra	Uttara-khand*	Mizo-ram	Mani-pur	Gujarat
1	<i>Abrus precatorius</i>	Gunja	Leaves	3	0	0	0	0
2	<i>Acacia concinna</i>	Shikekai	Fruits	290	0	0	0	0
3	<i>Achyranthes aspera</i>	Apmarga	Whole Plant	0	10	0	0	0
4	<i>Aconitum heterophyllum</i>	Atis	Rhizome	0	0.04	0	0	0
5	<i>Justicia adhatoda</i>	Vasa	Whole Plant	0	30	0	0	0
6	<i>Aquilaria malaccensis</i>	Agar	Stem	0	0	0	0.07	0
7	<i>Asparagus racemosus</i>	Shatavari	Roots	0	0	0	0	3
8	<i>Azadirachta indica</i>	Neem	Leaves	0	8	8	0	8
9	<i>Azadirachta indica</i>	Neem	Seeds	0	0	0	0	454
10	<i>Boswellia serrata</i>	Salai Gum	Gum	0	0	0	0	76
11	<i>Buchanania cochinchinensis</i>	Charoli	Fruits (Seeds)	2332	0	0	0	0
12	<i>Butea monosperma</i>	Palas	Gum	3533	0	0	0	0
13	<i>Butea monosperma</i>	Palas	Seed	400	0	0	0	0
14	<i>Butea monosperma</i>	Palas	Flower	9	0	0	0	0

S. No.	Species	Local Name	Parts Harvested	Quantity Harvested in 2014-15 (in qtls)				
				Maha-rashtra	Uttara-khand*	Mizo-ram	Mani-pur	Gujarat
15	<i>Cinnamomum tamala</i>	Leaves Tamlpatra	131	34	0	0	0	
16	<i>Dactylorhiza hatagirea</i>	Salam Panja	Rhizome	0	0.08	0	0	0
17	<i>Datura metel</i>	Dhatura	Whole Plant	0	8	0	0	0
18	<i>Desmodium gangeticum</i>	Salvan	Whole Plant	108	0	0	0	0
19	<i>Embelia ribes</i>	Vavding	Fruits	33	0	0	0	0
20	<i>Phyllanthus emblica</i>	Awala	Fruits	56	7	0	0	0
21	<i>Entada phaseoloides</i>	Garbi	Pods, Seeds	110	0	0	0	0
22	<i>Ficus benghalensis</i>	Vata	Leaves	0	5	0	0	0
23	<i>Ficus benghalensis</i>	Vata	Aerial Roots	0	3	0	0	0
24	<i>Garcinia gummi-gutta</i>	Kokum	Fruits	10	0	0	0	0
25	<i>Holarrhena antidysentrica</i>	Inderjao	Seeds	0	0	0	0	1
26	<i>Homalomena aromatica</i>	Anchiri	Rhizomes	0	0	167	0	0
27	<i>Madhuca longifolia</i>	Mahua	Flowers	9593	0	0	0	3737
28	<i>Madhuca longifolia</i>	Mahuda	Seeds	0	0	0	0	1108
29	<i>Mesua ferrea</i>	Nagkesor	Flower	0	0	0	66	0
30	<i>Mucuna pruriens</i>	Kaunch	Seeds	0	0	0	0	29
31	<i>Operculina turpethum</i>	Black nasotar	Roots	0	0	0	0	100.4
32	<i>Ophiocordyceps sinensis</i>	Yarsa gumba	Caterpillar-fungus	0	3	0	0	0
33	<i>Panax pseudoginseng</i>	Ginseng	Rhizome	0	0	0	8.6	0
34	<i>Paris polyphylla</i>	Satua	Roots	0	2	0	0	0
35	<i>Parmelia spp.</i>	Jhula	Thallus	0	12257	0	0	0
36	<i>Phyllanthus emblica</i>	Amla	Fruit Pulp	0	0	0	0	30
37	<i>Pongamia pinnata</i>	Karanj	Seeds, Fruits	174	0	0	0	0
38	<i>Prosopis cineraria</i>	Prosopis Gum	Gum	0	0	0	0	830
39	<i>Rumex hastatus</i>	Bhilmora	Whole Plant	0	30	0	0	0
40	<i>Saccharum munja</i>	Sarkanda	Roots	0	8	0	0	0
41	<i>Semecarpus anacardium</i>	Biba	Fruits	168	0	0	0	0
42	<i>Sida cordifolia</i>	Khreti Bala	Whole Plant	0	10	0	0	0
43	<i>Smilax aspera</i>	Smilax	Root	0	0	0	42.5	0
44	<i>Solanum virginianum</i>	Bhoiringni, Kantakari	Whole Plant	0	2	0	0	5

S. No.	Species	Local Name	Parts Harvested	Quantity Harvested in 2014-15 (in qtls)				
				Maha-rashtra	Uttara-khand*	Mizo-ram	Mani-pur	Gujarat
45	<i>Sterculia urens</i>	Kadaya Gum	Gum	0	0	0	0	16
46	<i>Strobilanthes ciliata</i>	Karvi	Roots, Leaves	2760	0	0	0	0
47	<i>Syzygium cumini</i>	Jambu	Seeds	0	0	0	0	2.5
48	<i>Tacca aspera</i>	Dukarkand	Tubers	15	0	0	0	0
49	<i>Tamarindus indica</i>	Chinch	Fruits	1	0	0	0	0
50	<i>Terminalia bellirica</i>	Behada	Fruits	2424	1	0	0	4.7
51	<i>Terminalia bellirica</i>	Behada	Fruit Rind	0	0	0	0	30
52	<i>Terminalia chebula</i>	Hirda	Fruits	10301	0	0	0	5
53	<i>Tinospora cordifolia</i>	Gulwel	Stem	274	6	0	0	0

*Uttarakhand Forest Development Corporation

In addition to the data presented in the above table, some information about the wild collection and trade of 'kullu gum' (*Sterculia urens*) and 'van tulasi' (*Ocimum gratissimum*) has been obtained. As per data maintained by the Madhya Pradesh MFP Federation, the extraction and trade of 'kullu gum' is showing a declining trend and the total production had reduced from 567 qtls. of 'kullu gum' collected and traded by the Federation during 2006-07 to collection of only 7 qtls. of 'kullu gum' during 2014-15. The Chhattisgarh MFP Federation has reported trade of 119 quintals of 'van tulasi' through the Federation during 2014-15.

The non-maintenance of any record by the state forest departments in respect of medicinal plant species that are routinely collected destructively from the wild is an issue of major concern. For example, no record of wild harvest of the tree species forming key constituent of 'dashamoola' group could be gathered from any of the state forest departments. Knowing that the domestic herbal industry consumes the wood and roots of each of the five tree species of this group in large quantities every year and that forests are the only source of supply of these species, the continuous damage to the resource that is happening without apparent knowledge of the forest managers is sure a cause of concern.

Similarly, some species that have come under large scale commercial exploitation in the recent past also seem to be missing from the data base of the State Forest Departments. The wild collection of Nag Chhatri (*Trillidium govanianum*) and Ban Lahsun (*Fritillaria roylei*) from north-western Himalayan states can be cited as examples. Wild collection of species like 'basanti' (*Hypericum perforatum*), *Euphrasia*, 'bankakri' roots (*Podophyllum hexandrum*), 'thyme' (*Thymus serpyllum*), 'kakanach' (*Solanum pseudo-capsicum*), 'Himalayan blue poppy' (*Meconopsis aculeata*), 'kala zira' (*Bunium persicum*) from forests came to notice during interactions with local wild gatherers and traders in Himachal Pradesh. Similarly, wild harvest of 'badiyan' (*Illicium griffithii*), 'majith' (*Rubia cordifolia*), 'satva' (*Paris polyphylla*), and 'syonka' bark (*Oroxylum indicum*) was reported from the forests of the north-eastern states. No official record of such wild harvests from forest areas, however, was available.

5.2.2. From Outside Forests: As far as wild harvest from the habitats outside forests is concerned, herbal raw drugs pertaining to 59 medicinal plant species in high trade are regularly collected from these habitats. However, no record of the quantum of annual harvests or the localities from where such material is harvested is available.

5.3. SOME CASE STUDIES OF WILD HARVEST

5.3.1: Harvest of Anardana (Seeds of *Punica granatum*)

Anardana or pomegranate (*Punica granatum*) seeds form an important raw material under the Indian Systems of Medicine. Trade of pomegranate seeds extracted from the fruits of pomegranate trees growing wild in the lower hills of Himachal Pradesh forms an important source of cash income to the local people. Whereas the wild pomegranate trees occurring on forest land are forest property, the local communities have been granted the right to collect its fruits and sell its seeds. Collection of fruits from the forest areas usually takes place during August-September on a day fixed by the local forest authorities in consultation with local people. On the scheduled day, local people go to the forest to harvest pomegranate fruits from the trees that the community has divided amongst themselves under non-formal arrangement. The collection starts early in the morning and continues up to midday (because the fruit is difficult to sight in bright sunshine) and then again from evening till dusk. The average harvest per person is about 20-25 kg. It means that more hands a family has on the day, more harvest the family can make. Harvest from pomegranate trees growing on private lands is done during October when the fruits are fully ripe and when the seed quality is also considered better.

All members of the family participate in the seed separation process. The opened fruits are spread on jute bags or tarpaulin for sun drying to make extraction of seeds easier. Seeds are usually removed with hands, but sometimes wooden sticks are also used to separate from the rind. The extracted seeds are spread on roofs and sun dried to make anardana. One kilogram of fully ripened fresh fruit yields on an average 100 gms of anardana. Most of the families in the study area in Shimla district are able to extract 70-80 kgs of anardana from the trees on forest lands and from private trees per year, of which they retain 4-5 kilograms for their own consumption



Local people engaged in wild harvest and extraction of Pomegranate seeds

and sell the remaining quantity. At an average sale price is ₹400 per kilogram at the farm gate for good quality anardana (the retail price in Shimla market at ₹600 per kg), the annual cash income of each of the families from sale of anardana comes to more than ₹25,000.

The fruit rind, presently of no commercial value in this region, is either used for composting or is dried to be used as fuel during winters.

In view of the contribution 'anardana' makes to the livelihoods of local communities, the local forest department has been augmenting the wild populations of pomegranate in the area through plantations. The fruits are, however, susceptible to insect attack that sometimes adversely affects the yield [with inputs from Ms. Drishti Sharma, HFRI].

5.3.2: Collection and Trade of Yartsa Gumba (*Ophiocordyceps sinensis*)

Collection of Keera Jari or Yartsa Gumba, a caterpillar fungus (*Ophiocordyceps sinensis* = *Cordyceps sinensis*) found at altitudes between 3,000 to 4,500 m asl in the Tibetan Plateau, has become one of the major and very lucrative sources of cash income for the local communities of the region. In India, its major occurrence has been reported from alpine meadows of Pithoragarh in Kumaon hills, Uttarakhand. Occurrence of this caterpillar fungus is also reported from Chamoli and Uttarakashi districts of Garhwal Himalaya in the state.



Survey for Yartsa Gumba on steep slopes in Chhipla Kedar (Pithoragarh, Uttarakhand)

A field study to assess the current harvesting practices and recent trends in the availability of Yartsa Gumba was undertaken during early June 2015 in the alpine meadows (3600-4400 m asl) around Chhipla Kedar and Najurikot in Pithoragarh district of Uttarakhand. The areas above 4000

masl were still under snow and the gatherers, already camping in the prime areas, were awaiting snow melt and emergence of the Yartsa Gumba. The past Keera Jari collectors were taken as guides and facilitators for interviewing other gatherers to know about the status and extraction pattern. The experienced collectors informed that about 2200-4000 dried pieces of Keera Jari made one kg weight. The rate of a single piece could be upto ₹ 500 depending upon the size, colour, taste and annual collection levels, with the material from the higher altitudes and pieces of large sizes, golden colour and neutral taste fetching higher prices. An idea about the high stakes in Yartsa Gumba trade can be had from the fact that an estimated 1 MT of this produce at a market value to the tune of ₹ 100 crore is collected in Uttarakhand every year!

The collectors were consistent in stating that the availability of Yartsa Gumba has been on the decline over the last 4-5 years with the current year being particularly poor in Yartsa Gumba production, possibly due to dry spell during May- June. They also expressed their concern about the increasing number of people reaching the alpine slopes in search of Keera Jari and the increasing associated conflicts.

The state of Uttarakhand has, since 2004, made it mandatory for all forest produce to be auctioned only through Uttarakhand Forest Development Corporation's Herbal Depots. Scrutiny of the auction data of the Corporation Herbal Depots, however, reveals that out of the huge annual collections, it was only during 2014-15 that 2.8 kg of Yartsa Gumba was received at these mandis! Despite concerns about unregulated and destructive harvest of Keera Jari expressed by different agencies (UFDC, 2009), the situation has not changed. Even as collection of Yartsa Gumba has been equated with 'gold rush' helping transform the livelihood of mountain dwellers, concerns are being expressed about the adverse impact the human activities related to collection of Yartsa Gumba are having on the alpine ecology (Yadav, 2016). The call of nature to regulate the collections, if only to save the species from extinction, needs to be given immediate attention. [With inputs from Dr. G S Rawat, Ishwari Dutt Rai and Gautam Talukdar, WII]

5.3.3: 'Nag Chhatri' and 'Ban Lahsun' - A Case of Highly Destructive Wild Extraction

Extraction of two high Himalayans herbs i.e. 'Nag Chhatri', also known as 'Satva' in trade, (*Trillidium govanianum*) for its rhizomes and 'Ban Lahsun' (*Fritillaria roylei*) for its bulbs witnessed a sudden spurt between 2009-10 and 2014-15 in Himachal Pradesh, Jammu & Kashmir and Uttarakhand. Over these five years the price payable to wild gatherers for one kilogram of dried rhizomes of 'Nag Chhatri' shot up from ₹ 800 to ₹ 2600. Similarly, the price paid to wild gatherers for one kilogram of dried bulbs of 'Ban Lahsun' rose from ₹ 1200 to ₹ 6000 during the same period. An idea about the level of destructive harvest could be had from the fact that it requires uprooting of an average of 2000 plants to make one kilogram of dried material in respect of each of these species. The lucrative price of these species resulted in collection of these species even from the areas closed for collection during a particular year, causing seizure of large quantities of such illicitly collected material. The lure of high returns, however, made the people take such seizures in their



Trillidium govanianum



Fritillaria roylei

stride and continue with ruthless wild harvest of these two entities causing near decimation of wild populations of both these species.

Another impact of engagement of local wild gatherers in harvest of these two species made the wild harvest of other usually collected medicinal plant species from the high hills non-remunerative, creating their shortage in the market. It is only during the current year that the prices of both these species have come down to ₹ 1800 and ₹ 3000 per kg respectively providing a respite to their wild harvest.

5.3.4: Harvest of Bahera, Harar and Amla (Fruits of *Terminalia bellirica*, *Terminalia chebula* and *Phyllanthus emblica*)

The fruits of 'bahera', 'harar' and 'amlam' form the three key ingredients of Triphala for which these are collected in very large quantities. The herbal industry usually accepts de-seeded dried fruits. Bahera, harar and amla trees occur naturally in tropical dry deciduous and semi-evergreen forests across the country. Since deseeding and drying of 'bahera', 'harar' and 'amlam' is a labour intensive work, this activity is confined mainly to the remote forest-fringe villages with few opportunities of income generation. A visit was made to one such village in Odisha during January 2016 to understand the process involved in collection and post-harvest handling of these three fruits. The village Sitaparhi, in Balliguda block, Kandhamal district of Odisha is a remote tribal village with little avenues of cash income.

Most of the collection of 'bahera', 'harar' and 'amlam' is done by the women, who have organized themselves in to Self Help Group (SHG) for collection and processing of herbal raw drugs. These



Deseeding and drying of 'Bahera'

women go to the nearby forests in small groups with at least one male member to climb the trees and shake the branches to make the fruits fall. The women then collect the fruits from the ground, and carry back the sacks on their heads to the village.

The SHG members informed that 'bahera' trees from around villages were ruthlessly felled for brick kiln fuel some years back and that now they had to go deep inside the forests to make collections, incurring additional expenditure on transport of the harvested produce. The 'harar' trees were rather scatted and involved more labour in its collection.



Deseeding of 'Harar'

The fresh 'bahera', 'harar' and 'amla' fruits are spread for a day or two for the moisture from the skin to evaporate and to make the rind easily open. It is the old women in the household who usually do the deseeding work by manually breaking the fruits with locally available stones. Deseeding of 'bahera' and 'harar' fruits is a very intense work as any distraction can cause injury to the fingers.

The deseeded rind is then spread on floor or on tarpaulins for 5-6 days and turned every few hours to let it dry. The dried material is then packed into jute bags and stacked till picked up for sale by the local agent.



Deseeded 'Amla'

Dried and deseeded 'bahera' fruits fetch a low price of ₹ 8-10 per kg, and the rates for dried deseeded fruits of 'harar' and 'amla' were informed to be ₹ 12-14 per kg and ₹ 45-50 per kg respectively. During discussions with the SHG members, it came out that they collect 40-50 kg of 'bahera' fruits per person per day. After deseeding, only about 10 kg of dried 'bahera' is left.



SHG members in Kandhamal district of Odisha with deseeded and dried 'harar' & 'bahera'

The SHG members expressed that the returns from collection and processing of raw drugs was much less than the wages under MNREGA (₹ 226 per day) and local agricultural activities (₹ 150 per day). In addition, the collection involved risk of injury and life.

The SHG members informed that many a times, the persistent overcast sky caused delay in drying of material spoiling its colour and appearance. They requested for some quick drying mechanisms to be installed at their village. The SHG members also informed that it was the collective initiative of the Odisha Forest Department, the Baitarani Initiatives, an NGO and the Dabur India Ltd. that was promoting collection, processing and trade of wild medicinal produce from the area. They were also praise for Mr. Jatinanda, a Community Resource Person (CRP) appointed under this initiative and working in a cluster of 10 villages. Mr. Jatinanda was acting as a link between the Self Help Groups (SHGs) of these 10 villages and the consortium and was facilitating sustainable harvest and processing of Harar, Bahera and Amla.

5.4. HERBAL RAW DRUGS COLLECTED FROM HABITATS OUTSIDE FORESTS

Habitats outside forests including agricultural farms, fallow lands, road/ rail sides, canal banks, ponds and lakes, and waste lands have traditionally been a very crucial source of herbal raw drugs used locally and at commercial scale. These habitats form the only or the major source of some very important herbal raw drug entities like 'gokshura', 'bala', 'punarnava', 'apmarga', 'bhumi amla', 'parpata', 'durva', 'musta', 'nagar motha', 'shankhapushapi', 'rasna', etc. In fact, 59 medicinal plant species recorded in high trade in the country are sourced from the habitats outside forests. The species growing in these habitats are known to be aggressive colonisers, and in normal circumstances would continue to grow in abundance.

However, the herbal raw drug supplies from this in case of seemingly infinite source have now become a cause of concern. In some cases, viz. *Fumaria indica*, *Alhagi pseudalhagi*, *Convolvulus prostratus*, *Citrullus colocynthis*, *Tribulus* spp., etc., the very habitat has got shrunk over the years due to intensification of agriculture whereby large chunks of hitherto fallow lands forming habitat for these species have been brought under plough. The availability of some species like *Cissus quadrangularis* and *Cardiospermum halicacabum* is also reported to be getting reduced due to over collection to meet the rising commercial and household demand.

Another issue of serious concern related to these habitats is the increasing contamination and pollution of these landscapes. While the agricultural lands have become much exposed to overdoses of fertilisers, insecticides, fungisides and weedisides, many of the waste lands and road/ rail/ canal sides have come under discharge of industrial effluents and sewer water, making the medicinal plants growing in these habitats non-suitable as herbal raw drugs.

Pilot cultivation of some of these species like *Bacopa monnieri*, *Centella asiatica*, *Cyperus scariosus*, *Phyllanthus amarus*, *Solanum nigrum*, etc. to get authentic and unadulterated material has already been initiated. It would need to be strengthened and more species from this group would need to be brought under domestication.

5.5. COMMUNITY BASED INITIATIVES FOR COLLECTION & MARKETING OF MEDICINAL PLANTS

Destructive wild collection practices and poor post harvest handling of wild collected herbal raw drugs are very largely responsible for depleting natural populations of many medicinal plant species on one hand and low quality of the produce on the other. Collection of immature parts requires harvesting of larger number of plants per unit of weight. In addition, such harvest is lower

in quality as the active ingredients have not yet fully developed in immature plants. Harvesting of immature plants also impacts the regeneration as most of such harvesting is done before the plants had chance to shed mature seeds.

Post harvest handling of wild collected produce is another area of concern. Usually the wild gatherers have to go to areas away from their villages to collect the plant material. The freshly collected material has to, therefore, be kept in sacks for long periods till the wild gatherers reach back their homes. This material is then spread directly on the surface for drying at all types of available places - courtyards, fallow fields, roof tops, etc., and exposed to dirt and foreign matter. Only at a very few places, the material was seen spread over tarpaulins or jute sheets. Proper drying platforms were nowhere to be seen. Many a times the material has to be kept stacked due to overcast conditions resulting in fungal attacks and damage to the material. Also the drying, processing and grading is a purely individualistic activity. Non-availability of the drying platforms and storage facilities at the village level is a major drawback in maintaining quality of the produce.

It is to address these issues that NMPB is supporting creation of Community Raw Drug Storage Facilities (>800 ft² each) at village level. One such recently completed facility was visited at Targabali village in Phiringia Range of Phulbani Forest Division in Odisha. A drying platform was also under construction as part of this facility. Even as the facility was under construction, question emerged about operationalization of the facility. It was realised that mere creation of facility will not serve the objective unless the communities are organized and encouraged to make use of the facility. Appropriate record keeping mechanisms of the material stored and disposed off were also required to be worked out. With these questions in mind, the Odisha Forest Department is now making efforts to link this facility with the SHGs that were created under the recently concluded JICA funded Orissa State Forest Development Project (OSFDP).

To kick start this linkage, Community Resource Persons (CRP) have been engaged to facilitate the functioning of the SHGs. The State Forest Department has also entered into understanding with Dabur India Ltd. that has come forward to procure the material collected by the SHGs. Baitarani Initiative, a local NGO, has joined hands with Dabur India Ltd. to facilitate organized collections and processing. The Community Resource Person and the staff of Baitarani Initiative are approaching the communities and creating clusters of about 10 SHGs with one SHG designated as Aggregating SHG per cluster. For the Targaballi Cluster, SHG of Gurupada village has been designated as the aggregating SHG. The SHGs were, at the time of our visit, were engaged in collecting 'harar', 'bahera' and 'amla' with 'shatavari' and 'dhobi nut' also being collected in small quantities.

As a result of these efforts, members of the cluster SHGs had already started bringing their produce - individually or collectively; in raw or processed form; loose or packed - to the Aggregating SHG. The Aggregating SHG was processing and stocking the material, keeping record, and was dispatching the material. We noticed 10 bags (30 kg each) of processed (deseeded) 'bahera' already stored in the facility. Dabur India Ltd. had announced its requirement and pricing in the beginning. The SHG members informed that they were getting their payments fairly fast.

This type of facilities and implementation mechanism is required to be set up at the village level to regulate wild collections and effective post harvest handling of the wild collected herbal material.

5.6. WILD MEDICINAL PLANTS OF CONSERVATION CONCERN CURRENTLY BEING TRADED IN HIGH VOLUMES

The current study on assessment of trade of botanical drugs in our country has revealed that herbal raw drugs pertaining to 242 plant species are in significant trade i.e. the annual demand for each of these botanicals exceeds 100 MT per year. 173 of these species are sourced almost entirely from the wild of which 114 species are found mainly or entirely, in India's forests. It is important to examine each of these 114 species to assess the impact of this trade and resulting lessons for the management and conservation of these valuable forest resources. This requires a reliable and rapid assessment of conservation status of each of these forest species recorded in high volume trade.

Using a Conservation Assessment and Management Prioritisation (CAMP) technique, an initiative to assess conservation status of wild medicinal plants species is in operation since 1995. Led by the Foundation for Revitalisation of Local Health Traditions (FRLHT), a total of 18 States have been covered under this initiative so far. A compilation of the results of these exercises has resulted in enlistment of 344 wild medicinal plant species that have been assigned Red List status ranging from Near Threatened (NT) to Critically Endangered (CR) for one or more states.

Conservation Assessment and Management Prioritization (CAMP) is a technique that allows rapid assessment of the conservation status of wild medicinal plants. Essentially involving 30-40 experts consisting of well-known field taxonomists, forest managers, traders as well as knowledgeable local practitioners of Indian Systems of Medicine (ISM), this exercise is carried out in the form of a workshop. These workshops, usually organized regionally with States as a unit, assess conservation status of prioritized medicinal plant species of the State using IUCN Red List Criteria & Categories and drawing upon the collective knowledge of the participants in the workshop.

In order to draw lessons for developing informed management responses for these wild resources a tabulation has been prepared enlisting 49 threatened medicinal plants which have been recorded in high volume trade also (table 5.2). These 49 medicinal plant species have been assessed as "Threatened" in one or more states of India while these are also recorded in high volume trade. An analysis of the listed species reveals that more than one third of these (17 species) belong to the temperate forests of the Himalayan states. Out of these 17 Himalayan species 9 are alpine herbs like *Aconitum heterophyllum*, *Picrorhiza kurroa*, *Rheum moorcroftianum*, *Valeriana hardwickii*, *Valeriana jatamansi*, *Nardostachys grandiflora* etc.

A few of these threatened species, in high volume trade, are endemic to the Western Ghats region of Western and South Western India e.g. *Garcinia indica*, *Coscinium fenestratum*, *Cinnamomum sulphuratum*, *Nilgirianthus ciliatus* and *Vateria indica*.

Adequate attention of the forest managers and policy makers is needed to take note of this and ensure that these valuable wild medicinal resources are sustainably used and conserved in their natural habitats.

Table 5.2. Red-listed Medicinal Plant Species recorded in High Trade

S. No.	Botanical Names	Habit	Assessed Conservation Status
1	<i>Aconitum ferox</i>	H	Assessed as Endangered in Arunachal Pradesh, Sikkim and West Bengal.
2	<i>Aconitum heterophyllum</i>	H	Assessed as Critically Endangered in Jammu & Kashmir, Himachal Pradesh and Uttarakhand.
3	<i>Aquilaria malaccensis</i>	T	Assessed as Critically Endangered in Arunachal Pradesh and Endangered in Assam and Meghalaya.
4	<i>Berberis aristata</i>	S	Assessed as Vulnerable in West Bengal
5	<i>Bergenia ciliata</i>	H	Assessed as Vulnerable in Arunachal Pradesh, Meghalaya and Sikkim.
6	<i>Boswellia serrata</i>	T	Assessed as Endangered in Rajasthan; Vulnerable in Chhattisgarh and Madhya Pradesh
7	<i>Buchanania lanzan</i>	T	Assessed as Vulnerable in Rajasthan ; Near Threatened in Chhattisgarh and Madhya Pradesh
8	<i>Celastrus paniculatus</i>	C	Assessed as Endangered in West Bengal; Vulnerable in Kerala, Chhattisgarh, Madhya Pradesh, Rajasthan and Orissa; Near Threatened in Karnataka, Tamil Nadu and Andhra Pradesh.
9	<i>Chlorophytum tuberosum</i>	H	Assessed as Vulnerable in Chhattisgarh, Madhya Pradesh
10	<i>Cinnamomum sulphuratum</i>	T	Assessed as Vulnerable in Karnataka, Kerala, and Tamil Nadu. Endemic to West Bengal
11	<i>Cinnamomum tamala</i>	T	Assessed as Endangered in Jammu & Kashmir and Vulnerable in Arunachal Pradesh, Meghalaya, Himachal Pradesh and Uttarakhand
12	<i>Commiphora wightii</i>	S	Critically Endangered in Rajasthan, Madhya Pradesh and Gujarat
13	<i>Cosciniium fenestratum</i>	C	Assessed as Critically Endangered in Karnataka, Kerala and Tamil Nadu
14	<i>Decalepis hamiltonii</i>	C	Assessed as Endangered in Karnataka, Kerala, Tamil Nadu and Andhra Pradesh
15	<i>Embelia ribes Burm</i>	C	Assessed as Critically Endangered in AP; Vulnerable in Karnataka, Tamil Nadu and Orissa; Near Threatened in Kerala
16	<i>Embelia tsjeriam-cottam</i>	S	Assessed as Vulnerable in Karnataka, Kerala, Tamil Nadu, Maharashtra, Madhya Pradesh, Jammu & Kashmir, Himachal Pradesh, Uttarakhand and Orissa; Near Threatened in Chhattisgarh
17	<i>Ephedra gerardiana</i>	S	Assessed as Endangered in Jammu & Kashmir, Himachal Pradesh and Uttarakhand
18	<i>Garcinia indica</i>	T	Assessed as Vulnerable in Karnataka and Kerala; Near Threatened in Maharashtra Endemic to Western Ghats.

S. No.	Botanical Names	Habit	Assessed Conservation Status
19	<i>Gloriosa superba</i>	C	Assessed as Endangered in Orissa; Vulnerable in Karnataka, Kerala, Andhra Pradesh, Maharashtra, Chhattisgarh, Madhya Pradesh, Jammu & Kashmir, Himachal Pradesh, Uttarakhand, West Bengal and Rajasthan.
20	<i>Gymnema sylvestre</i>	C	Assessed as Endangered in Rajasthan; Vulnerable in Andhra Pradesh, Chhattisgarh, Madhya Pradesh and West Bengal; Near Threatened in Maharashtra
21	<i>Holostemma ada-kodien</i>	C	Assessed as Critically Endangered in Maharashtra; Endangered in Kerala; Vulnerable in Karnataka and Rajasthan; Near Threatened in Andhra Pradesh and Tamil Nadu
22	<i>Jurinea dolomiaea</i>	H	Assessed as Endangered in Jammu & Kashmir, Himachal Pradesh and Uttarakhand
23	<i>Litsea glutinosa</i>	T	Assessed as Critically endangered in Andhra Pradesh; Endangered in Jammu Kashmir; Vulnerable in Chattishgarh, Madhyapradesh, Himachal Pradesh and Orissa; Near Threatened in Uttarakand
24	<i>Mesua ferrea</i>	T	Assessed as Endangered in West Bengal and Orissa
25	<i>Nardostachys grandiflora</i>	H	Assessed as Critically endangered in Uttarakhand; Endangered in Arunachal Pradesh, Sikkim and Himachal Pradesh
26	<i>Nilgirianthus ciliatus</i>	S	Assessed as Endangered in Karnataka, Kerala and Tamil Nadu; Endemic to Western Ghats.
27	<i>Operculina turpethum</i>	C	Assessed as Endangered in Kerala, Maharashtra; Vulnerable in Karnataka, Orissa; Near Threatened in Tamil Nadu, Chhattisgarh and Madhya Pradesh;
28	<i>Oroxylum indicum</i>	T	Assessed as Endangered in Kerala, Maharashtra, Rajasthan, Orissa; Vulnerable in Karnataka, Andhra Pradesh, Chhattisgarh, Madhya Pradesh, Arunachal Pradesh, Assam, Meghalaya and Sikkim;
29	<i>Picrorhiza kurrooa</i>	H	Assessed as Critically Endangered in Uttarakhand and West Bengal: Endangered in Arunachal Pradesh, Jammu & Kashmir, Himachal Pradesh; Vulnerable in Sikkim; Not evaluated in Assam and Meghalaya
30	<i>Pseudarthria viscida</i>	H	Assessed as Vulnerable in Karnataka, Kerala; Near Threatened in Tamil Nadu.
31	<i>Pterocarpus marsupium</i>	T	Assessed as Critically Endangered in Rajasthan; Endangered in West Bengal, Orissa; Vulnerable in Maharashtra, Chhattisgarh and Madhya Pradesh
32	<i>Pterocarpus santalinus</i>	T	Assessed as Critically Endangered in Andhra Pradesh. Endemic
33	<i>Rauvolfia serpentina</i>	H	Assessed as Critically Endangered in Andhra Pradesh, Maharashtra, Chhattisgarh, Arunachal Pradesh,

S. No.	Botanical Names	Habit	Assessed Conservation Status
			Himachal Pradesh; Endangered in Karnaataka, Kerala, Tamil Nadu, West Bengal; Vulnerable in Madhya Pradesh, Assam, Meghalaya, Jammu & Kashmir and Uttarakhand
34	<i>Rheum emodi</i>	H	Assessed as Endangered in Jammu & Kashmir, Himachal Pradesh and Uttarakhand
35	<i>Rheum moorcroftianum</i>	H	Assessed as Endangered in Himachal Pradesh; Vulnerable in Jammu & Kashmir; Near Threatened in Uttarakhand
36	<i>Rhododendron anthopogon</i>	S	Assessed as Endangered in Sikkim, Vulnerable in Arunachal Pradesh, Jammu & Kashmir and Himachal Pradesh; Near Threatened in Uttarakhand
37	<i>Rubia cordifolia</i>	H	Assessed as Vulnerable in Andhra Pradesh, Maharashtra, Chhattisgarh and Arunachal Pradesh
38	<i>Santalum album</i>	T	Assessed as Endangered in Kerala, Tamil Nadu, Andhra Pradesh, Maharashtra; Vulnerable in Karnataka
39	<i>Saraca asoca</i>	T	Assessed as Critically Endangered in Orissa; Endangered in Karnataka, Andhra Pradesh, Maharashtra, Data Deficient in Kerala and Tamil Nadu
40	<i>Saussurea costus</i>	H	Assessed as Critically Endangered in Jammu & Kashmir. Endemic to Western Ghats.
41	<i>Schrebera swietenoides</i>	T	Assessed as Vulnerable in Karnataka Rajasthan and Orissa
42	<i>Smilax glabra</i>	C	Assessed as Critically Endangered in Arunachal Pradesh, Assam and Meghalaya
43	<i>Sterculia urens</i>	T	Assessed as Endangered in Rajasthan; Vulnerable in Andhra Pradesh, Chhattisgarh and Madhya Pradesh.
44	<i>Swertia chirayita</i>	H	Assessed as Critically Endangered in Jammu & Kashmir, Himachal Pradesh and West Bengal; Endangered in Uttarakhand; Vulnerable in Arunachal Pradesh, Meghalaya and Sikkim.
45	<i>Symplocos racemosa</i>	T	Assessed as Critically Endangered in Orissa; Vulnerable in Karnataka and Maharashtra; Near Threatened in Tamil Nadu.
46	<i>Taxus wallichiana</i>	T	Assessed as Critically Endangered in Meghalaya, and West Bengal; Endangered in Arunachal Pradesh, Sikkim, Jammu & Kashmir, Himachal Pradesh and Uttarakhand.
47	<i>Valeriana hardwickii</i>	H	Assessed as Vulnerable in Arunachal Pradesh, Meghalaya and Sikkim.
48	<i>Valeriana jatamansi</i>	H	Assessed as Vulnerable in Arunachal Pradesh, Meghalaya, Sikkim, Jammu & Kashmir, Himachal Pradesh and Uttarakhand.
49	<i>Vateria indica</i>	T	Assessed as Vulnerable in Karnataka, Kerala and Tamil Nadu; Endemic to Western Ghats.

5.7. COLLECTION OF WILD MEDICINAL PLANTS: COMMUNITY BASED PRACTICES TOWARDS SUSTAINABLE HARVEST

Wild collection of medicinal plants forms a key source of cash income to millions of households across the country. Herb gatherers are known to eagerly wait for the next season of collection and schedule their activities around wild collection of medicinal herbs. For long, most of such wild collection has been sustainable with local communities knowing when and how much to collect. Although many of such sustainable harvest practices are on the vane due to increasing commercial demand and growing individualism in the society, some communities, one of which is cited below, are still religiously following the age old practices of wild collection, contributing to the conservation of wild medicinal plant resources.

Deodi, Tangnu and Janglik villages in Khashdhar Range of Rohru Forest Division form one of the most interior village clusters in Shimla district of Himachal Pradesh. The area remains under severe cold and snow for almost six months every year. The key activities of the villagers revolve around stocking provisions for themselves and for their livestock for these six months. Wild harvest of medicinal herbs forms one of the important sources of cash income for these communities.

Their area, however, opens for wild harvest only once in four years under the prescribed management regulations. The communities, instead of rushing to the alpine meadows immediately on opening of the area for wild collection to maximize collection of medicinal herbs, lay their faith in the local devta (deity), the 'Jakh Sa'ab' that decides the date of start of wild collection and the number of days such collection will be undertaken.



Temple of 'Jakh Sa'ab'

With the area declared opened for wild harvest in 2015, tentative period for starting wild collection of alpine herbs for the year was fixed from 1st week of October and the harvest was to continue for about 20 days. The local people were to pay obeisance to the local deity on the fixed date and were to proceed for wild collection to the alpine meadows. Wild collection in this area is done only by the local people and no hired labour is allowed for the purpose.

The system in vogue in this area ensures equitable chance of wild collection to all households. It also ensures that the collection is made when the plants are fully mature and that the seed has fully ripened. It also ensures that collections are being carried out sustainably under the watchful eyes of elders. The local communities actually did not engage in any harvesting during 2015 due to low projected demand and low procurement rates announced for the year and continuous bad weather. Local communities of two villages in Ladakh have initiated a different type of medicinal plant conservation and sustainable harvest practice. This initiative has been spearheaded by LSTM (Ladakh Society for Traditional Medicine), an NGO, that is helping the local communities in conservation of medicinal plants through awareness campaigns and community organisation. The LSTM plus community initiative has resulted in demarcation of Community Reserves-cum-Sustainable Harvesting areas at Rangdom Village in Zaskar and at Sapi Village in Kargil. The local village committees manage these reserves and regulate the collections from these areas. These

two community reserves have gained local prominence as medicinal plant rich areas and Amchis from far off areas come to these areas for making regulated collections of medicinal plants after paying fee to the village committees.

Such community based medicinal plant conservation initiatives need to be strengthened.

5.8. *IN SITU* CONSERVATION OF WILD MEDICINAL PLANTS - INITIATIVES

As the demand of herbal raw drugs is increasing, the list of wild medicinal plant species under threat is also increasing. The community based traditional practices of sustainable harvest, not able to cope up with the race for maximizing profits from wild collections, are gradually collapsing. The situation calls for urgent focused interventions to arrest the further decline of wild populations of medicinal plant species assessed as 'Red Listed'.

The issue has been sought to be addressed by following a multi-pronged strategy, which includes the following:

5.8.1: Establishment of Medicinal Plant Conservation Areas (MPCAs)

Conservation of Red Listed species in their natural habitat, i.e. *in situ* conservation, is considered to afford the best possible and the cheapest means to conserve on long-term basis the available gene pool of that species. A concept of establishing Medicinal Plant Conservation Areas (MPCAs) in forest areas traditionally known to be rich repositories of medicinal plants was developed at the Foundation for Revitalisation of Local Health Traditions (FRLHT) under the MoEF-DANIDA-FRLHT project. The concept was further refined to develop such MPCAs around viable populations of those medicinal plant species that needed priority conservation action. Starting with a network of 30 MPCAs established in Tamil Nadu, Kerala and Karnataka following the first approach, four more MPCAs were subsequently added following the second approach for focused conservation of *Saraca asoca*, *Coscinium fenestratum*, *Uleria salicifolia* and *Janakia arayalpatra*.



Thematic entrance to MPCA's

The MPCA concept was continued to be followed and MPCAs were established in Andhra Pradesh and Maharashtra under the UNDP supported CCF-I project and in Madhya Pradesh, Rajasthan, Odisha, and West Bengal under the UNDP supported CCF-II project. The MPCA network was further expanded under the recently concluded MoEF-UNDP-GEF project when more MPCAs were established in the states of Arunachal Pradesh, Chhattisgarh, and Uttarakhand. The common thread in the establishment of all these MPCAs is the stellar role of the FRLHT. List of the MPCAs established under all these initiatives is given in table 5.3. below:

Table 5.3. List of Medicinal Plant Conservation Areas (MPCAs) Established under various Projects

S. No.	Name of MPCA	District	Area (ha)	Year of Establishment	No. of recorded Medicinal Plant Species	Program under which Established
Tamil Nadu						
1	Petchparai	Nagercoil	210	1993 - 2003	244	
2	Mundanthurai	Tirunelveli	200	1993 - 2003	267	
3	Kutrallum	Tirunelveli	200	1993 - 2003	288	MoEF-
4	Thaniparai	Tirunelveli	100	1993 - 2003	259	DANIDA-
5	Alagarkovil	Ramanathapuram	250	1993 - 2003	227	FRLHT
6	Kodaikanal	Madurai	115	1993 - 2003	85	Project
7	Kodikarai	Nagapattinum	252	1993 - 2003	288	
8	Topslip	Coimbatore	229	1993 - 2003	189	
9	Kollihills	Salem	200	1993 - 2003	231	
10	Kurumbaram	Kanchipuram	108	1993 - 2003	317	
11	Thenmalai	Tiruvannamalai	150	1993 - 2003	320	
12	Nambikoil	KMTR	400	1993 - 2003	146	
Kerala						
13	Agasthiarmalai	Thiruvanantha-puram	174	1993 - 2003	217	
14	Triveni	Pathanamthitta	308	1993 - 2003	208	
15	Eravikulam	Idukki	200	1993 - 2003	83	MoEF-
16	Peechi	Thrissur	156	1993 - 2003	275	DANIDA-
17	Athirapally	Thrissur	112	1993 - 2003	234	FRLHT
18	Silent Valley	Pallakad	206	1993 - 2003	205	Project
19	Waynad	Wyanaadu	148	1993 - 2003	163	
20	Kulamavu	Idukki	*	1993 - 2003	182	
21	Anappady	Pallakad	*	1993 - 2003	271	
Karnataka						
22	BRT Hills	Mysore	150	1993 - 2003	259	
23	Talacauvery	Madikeri	80	1993 - 2003	255	
24	Savandurga	Bangalore	280	1993 - 2003	314	
25	Subramanya	Mangalore	200	1993 - 2003	220	
26	Charmadi	Mangalore	283	1993 - 2003	310	MoEF-
27	Devrayandurga	Tumkur	178	1993 - 2003	140	DANIDA-
28	Kudermukh	Chikmagalur	110	1993 - 2003	238	FRLHT
29	Kemmangundi	Chikmagalur	310	1993 - 2003	184	Project
30	Agumbe	Shimoga	210	1993 - 2003	270	
31	Devimane	Karwar	210	1993 - 2003	259	
32	Sandur	Bellary	350	1993 - 2003	238	
33	Karpakapalli	Bidar	150	1993 - 2003	150	
34	Kollur	Udupi	*	1998 - 2001	231	
Andhra Pradesh						
35	Mallur	Warangal	197	2001 - 2004	225	
36	Sukkumamidi	Kahmmam	200	2001 - 2004	288	UNDP-CCF-I
37	Maredumilli	East Goravari	260	2001 - 2004	214	
38	Lankapakalu	Visakhapatnam	275	2001 - 2004	104	

S. No.	Name of MPCA	District	Area (ha)	Year of Establishment	No. of recorded Medicinal Plant Species	Program under which Established
39	Coringa	East Godawari	350	2001 - 2004	25	
40	Peddacheruvu	Kurnool	220	2001 - 2004	177	
41	K. Kuntlapalli	Anantpur	313	2001 - 2004	266	
42	Talakona	Chittoor	200	2001 - 2004	202	
Maharashtra						
43	Gadmauli	Gadchiroli	200	2001 - 2004	92	
44	Nagzira	Gondia	200	2001 - 2004	81	
45	Bhaskaracharya	Jalgaon	500	2001 - 2004	124	
46	Yedshi Ramling	Osmanabad	100	2001 - 2004	124	
47	Toranmal	Nandurbar	584.59	2001 - 2004	228	
48	Chickkund deo	Nandurbar	180	2001 - 2004	*	UNDP-CCF-I
49	Kayare	Nashik	304	2001 - 2004	*	
50	Amboli	Sindhudurg	267.68	2001 - 2004	146	
51	Navaja	Satara	250	2001 - 2004	152	
52	SGNP Borivali	Thane	244.96	2001 - 2004	180	
53	Gullarghat	Amravati	635.66	2001 - 2004	168	
54	Honya Koli	Pune	592	2001 - 2004	183	
55	Amba	Raigad	150	2001 - 2004	118	
Madhya Pradesh						
56	Bhundakona	Anuppur	200	2008-09	152	
57	Latari Bithali	Balaghat	200	2008-09	129	
58	Chappari	Mandla	248	2008-09	129	
59	Panarpani	Hoshangabad	200	2008-09	143	
60	Shyamgiri	Panna	216	2008-09	169	
61	Kapoornala	Chhindwara	200	2008-09	*	
62	Hinota	Panna	200	2008-09	*	
63	Bhagpura	Khandwa	234	2008-09	*	UNDP-CCF- II
64	Pakka Paaracha	Sehore	200	2008-09	*	
65	BhinsaMukunda	Narsimpur	200	2008-09	*	
66	Narayanapur	Sagar	200	2008-09	*	
67	Nawali & Sawad	Mandsaur	250	2008-09	*	
68	Kupi-Jatashankri	Chhatarpur	200	2008-09	*	
Odisha						
69	Kapilash	Dhenkanal	200	2008-09	333	
70	Tamana	Khurda	200	2008-09	374	
71	Pradhanpat	Deogarh	200	2008-09	162	UNDP-CCF-II
72	Gurudongar	Nuapada	200	2008-09	352	
73	Satkosia	Mayurbhanj	200	2008-09	195	
West Bengal						
74	Tonglu	Tonglu	230	2008-09	254	
75	Dhortrey	Dhortrey	180	2008-09	154	
76	North Rajabhatkhawar	Buxaduar	400	2008-09	249	

S. No.	Name of MPCA	District	Area (ha)	Year of Establishment	No. of recorded Medicinal Plant Species	Program under which Established
77	North Sevoke	10th Mile	100	2008-09	209	UNDP-CCF-II
78	Sursuti	Lataguri	100	2008-09	216	
79	Garhpanchkot	Raghunathpur	250	2008-09	206	
80	Bonnie Camp	Raidighi	300	2008-09	30	
Rajasthan						
81	Ramkunda	Udaipur	300	2008-09	83	
82	Barkochra	Ajmer	71.6	2007-08	49	
83	Gajroop Sagar	Jaisalmer	100	2008-09		
84	Bhanwarkot	Banswara	200	2008-09	93	UNDP-CCF-II
85	Bada Bhakar	Jodhpur	250	2008-09		
86	Kumbhalgarh WLS	Rajsamand	124	2008-09	N	
87	Sitamata WLS	Chittorgarh	N.A.	2008-09	106	
Chhattisgarh						
88	Tiriya	Bastar	*	2009	*	
89	Bhatwa	Bastar	*	2009	*	
90	Jabara	Dhamtari	*	2009	*	MoEF-
91	Bandhatola	Rajnandgaon	*	2009	*	UNDP-GEF
92	Amadob	Bilaspur	*	2009	*	Project
93	Ghatpendari	Surguja	*	2009	*	
94	Patiya	Jashpur	*	2009	*	
Arunachal Pradesh						
95	Tezu - Parsuramkund	Lohit	*	2009	*	
96	Roing- Mayodia	Lower Dibang Valley	*	2009	*	MoEF-
97	Kanubari - Wannu	Tirap	*	2009	*	UNDP-GEF Project
98	Bomdila	West Kameng	*	2009	*	
99	Hake-Tari	Lower Subansiri	*	2009	*	
100	Lumla	Tawang	*	2009	*	
101	Dakpe	Daporijo	*	2009	*	
Uttarakhand						
102	Kandara	Utarkashi	*	2009	*	
103	Gangi	Tehri Garhwal	*	2009	*	
104	Jhuni	Bageshwar	*	2009	*	MoEF-
105	Mandal	Chamoli	*	2009	*	UNDP-GEF
106	Khaliya	Pithoragarh	*	2009	*	Project
107	Mohan	Almora	*	2009	*	
108	Bastiya	Champawat	*	2009	*	

As per the original concept, MPCAs were to be 'sanctum sanctorum' or 'hands off' areas, from where no removals of medicinal plants was allowed. Management of invasive alien species, fire protection and soil and moisture conservation were the only activities permissible in the MPCAs. To compensate the local communities for the rights forgone over these areas, other activities like developing medicinal plant nurseries, paying to the community group for management of the

MPCAs, etc. were included in the program as incentive. At some places, Medicinal Plant Development Areas (MPDAs) were also delineated around the MPCAs as buffer areas to provide facility to the local communities for harvest of medicinal plants. However, such buffer areas were not available around all the MPCAs.

5.8.2: NMPB Supported Medicinal Plant Conservation and Development Areas (MPCDAs)

The National Medicinal Plants Board has developed a modified concept of medicinal plant conservation through establishment of MPCDAs where the elements of augmentation of natural populations of Red Listed medicinal plant species and their sustainable utilization has been added to the original concept of MPCAs. Under this program, the Board is providing funding to the State Forest Departments for conservation and development of medicinal plants in the states, with a special focus on the Red Listed medicinal plant species. It is under this initiative that MPCDAs are at various stages of establishment in different states. List of such MPCDAs is given in table 5.4:

Table. 5.4. List of NMPB supported Medicinal Plant Conservation and Development Areas

S. No.	Name of MPCDA	S. No.	Name of MPCDA	S. No.	Name of MPCDA
Nagaland		27	Chandanapuri	54	Kodambale
1	Jalukie Village Peren Dist.	28	Comptt 191 Mendhavan	55	Achwe
2	Changtonya Mokokchung Dist.	29	Comptt 192 Mendhavan	56	Mahime
3	Chipvu Lurho Park	30	Vehelpaha Comptt 375	57	Jankadkal
4	Intanki National Park Peren	31	Vihali Comptt 284	Manipur	
Mizoram		32	Chandanapuri	58	Khangkhuikulle Ukhrul
5	Bilkhawthlir Kolasib Div.	Himachal Pradesh		59	Kailam Churachandpur
6	Vairengte Kolasib Div.	33	Dhel Thatch, GHNP, Kullu	60	Langol Imphal
7	Humunpui ram Thenzawl Div.	34	Dodra, Shimla	West Bengal	
8	Sialsik range Thenzawl Div.	35	Chhitkul, Kinnaur	61	Panchanai
Gujarat		36	Kukumseri, Lahaul Valley	62	Phalut
9	Mangvana Kutchh Circle	37	Modda Ka Tibba, Sirmour	63	Rechela
10	Gugliayna Kutchh Circle	Tamil Nadu		64	Bichabhanga
11	Thravda Kutchh Circle	38	Edmankarai Mannavannur	65	North Rajabhatkhowa
12	Ler Kutchh Circle	39	Thalavukanal Poombarai	66	Kankrajhore
13	Mathal Kutchh Circle	40	Jamendar Berijam	67	Susunia
14	Tharvada	41	Deramandu Perumpallam	Haryana	
Sikkim		42	Kumbakarai Devadanapatty	68	Rasulpur RF
15	Lashar Valley Lachen	43	Kollimalai	Karnataka	
16	Latui RF East Sikkim	44	Kurumbavam	69	Channarayanadurga
17	Mangrhing RF South Sikkim	45	Azhagarkoil	Koratage range 1	
18	Bhudang, Jhum W. Sikkim	46	Thanipparai	70	Channarayanadurga
Maharashtra		47	Mundanthurai	Koratage range 2	
19	Ambewadi Nashik range	48	Nambikoil	71	Thimalapura 1 Madhugiri range
20	Comptt 146 Mandavi range	49	Point Calimere	72	Thimalapura 2 Madhugiri range
21	Mendhavan Somata range	50	Topslip	73	Thimalapura 3 Madhugiri range
22	East Melghat Ghatang range	51	Pechiparai	74	Thimalapura 4 Madhugiri range
23	Chilkhadra Ghatang range	Madhya Pradesh		75	Kunda SF Honnethala
24	Wardha	52	Bhind	76	Nantur Shimoga
25	Pilapur	Karnataka			
26	Ajneneri	53	Shrigunj		

Details pertaining to area of the above mentioned MPCDAs and the floristic inventorisation of these areas were reported to be under finalization. Field enquiries from the concerned state authorities in Himachal Pradesh revealed that their effort had been to establish the MPCDAs around viable populations of priority Red Listed medicinal plant species. The exercise entailed extensive field surveys to locate viable populations of priority Red Listed medicinal plant species, and these surveys resulted in locating good wild populations of *Gentiana kurroo*, *Colchicum luteum*, *Betula utilis*, *Aconitum* spp., *Fritillaria roylei* and establishment of MPCDAs respectively at Modda ka Tibba, Kukumseri, Chhitkul, Dodra, and Dhel Thatch for these species. These MPCDAs also bear good wild populations of many other threatened species including *Trillidium govanianum*, *Polygonatum cirrhifolium*, *Rhododendron anthopogon*, *Podophyllum hexandum*, *Habenaria edgeworthii*, and *Habenaria intermedia*, etc.

5.8.3: Protected Area Network and Conservation of Red Listed Medicinal Plants

India has established a strong network of 108 National Parks, 528 Wild Life Sanctuaries, and 65 Conservation Reserves under the provisions of the Wildlife (Protection) Act, 1972 for conservation of wildlife. Even as the major conservation focus of these protected areas is on keystone animal species, the conservation efforts also include protection and management of habitats. Most of these areas are free from the burden of community rights or have limited community rights of extraction of bio-materials. Since these habitats also include medicinal plants, it is assumed that many medicinal plant species might be getting protected here. However, evaluation of such incidental protection of medicinal plant species is required.

5.8.4: In Situ Conservation: Way Forward

The initiatives listed at 5.8.1 and 5.8.2 need to be further strengthened by establishing MPCAs for the remaining Red Listed species. Protocols to periodically monitor and evaluate the efficacy of these sites in conserving the threatened wild populations of medicinal plant species are also needed to be put in place.

Since medicinal plants would continue to be harvested from the wild, it is desirable that appropriate inputs be made for strengthening the wild populations of the threatened medicinal plant species in their natural habitats. The local communities traditionally engaged in harvesting of these medicinal plants for self use or sale would need to be involved in such initiatives. There exists an instrument of Joint Forest Management (JFM) under which the local communities can be made responsible for management of the given patch of forest, where the communities can, with the local forest department, grow native trees, shrubs and herbs and share the benefits of the produce on harvest. It would be very useful to make use of this JFM instrument and create 'Community Medicinal Plant Reserves' (CMPRs), to be managed by the local community.