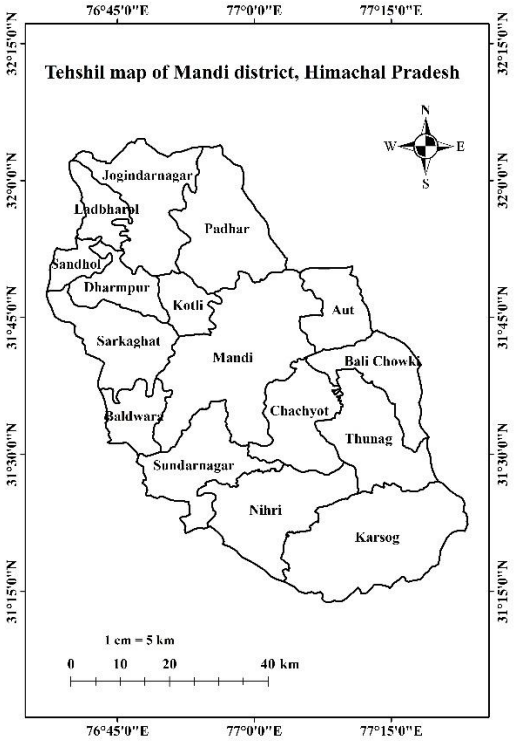
Project Report

Consultancy project to undertake the assessment of availability of diflerent NTFPs (Medicinal and Aromatic Plants) of 20 VFDS in Mandi district of HP

Sponsored by

Himachal Pradesh Forest Department (JICA Project)



Prepared by

CSIR-Institute of Himalayan Bioresource Technology

(Council of Scientific and Industrial Research)

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Total VFDS: 20

Preface

A majority of herbal plants, major proportion of which is derived from wild, provide the resource base to the herbal industry. Although global demand for herbal medicines is increasing, its dwindling supply due to over-harvesting, from their natural habitat is one of the major threats, and hence cultivation of these should be promoted. Moreover, collection from wild does not guarantee the authenticity and quality. Today, according to the World Health Organization (WHO), 65-80% of the world's population living in developing countries depends essentially on plants for primary healthcare. The consolidated commercial demand of herbal raw drugs for the year 2014-15 was ~ 5,12,000 MT. Consumption by Domestic Herbal Industry was 1,95,000 MT. About 1178 medicinal plant species recorded in the practices of trade. Out of which, 242 plant species are used in annual quantities of more than 100 MT. Besides, many plants which are source of essential oil are also used in many preparations commonly used for health benefits and are source of income generation for the farmers. The global essential oils market demand was 226.9 kilotons in 2018. It is projected to expand at a CAGR of 8.6% from 2019 to 2025.Unlike aromatic plants, medicinal plants harvests are of high volumes and hence need strong linkages with the industry for immediate marketing of the produce to avoid post-harvest contaminations. Many medicinal herbs are being used by collecting from wild. Climate in Himachal Pradesh is suitable for cultivation of medicinal and aromatic plants and meeting the increasing demand of industry.

HP Forest Ecosystem Management and Livelihood Improvement Project (PIHPFEM&L) has set up a State Level Him Jadi-Buti Cell in PMU to coordinate all activities relating to conservation, promotion, sustainable management of NTFPs including Medicinal Plants. Eleven number of Cluster Level Him Jadi-Buti Societies/ Producer Groups have been set up to help right holders and growers of NTFPs and medicinal plants in sustainable management of NTFP and market access. Himachal Pradesh Forest Department (HPFD) through Society for Improvement of Forest Ecosystems Management and Livelihoods in HP signed a memorandum of understanding with CSIR-Institute of Himalayan Bioresource Technology (IHBT) Palampur, Kangra on dated September, 2020 and assigned the task of survey of Mandi district in 20 VFDS.

The present survey report with respect to district Mandi of Himachal Pradesh, comprises information about medicinal and aromatic plants (MAPs) found in 20 VFDS, plants suitable for commercial cultivation in forest area and under farmer field condition to meet the ever-increasing demand of herbal, flavour and fragrance industry. The support provided by the Director, CSIR-IHBT is praise worthy. We are also thankful to Dr Sanjay Uniyal and Er Amit Kumar, Senior Pricnipal Scintists of CSIR-IHBT, Palampur for providing necessary help during this project. The efforts made by the CSIR-IHBT team, cooperation from forest department officials, forest range officers, forest gaurds, and facilitators at different villages during the survey are duly acknowledged.

Rakesh Kumar

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Project Report

Study area: District Mandi

Mandi, one of the twelve districts of Himachal Pradesh, is situated in Western Himalayas between 31° 13′20″ to 32°04′30″ North latitude and 760 -37′ -20″ to 770 -23′ -15″ East longitude. It is bounded with six districts and is almost in the center of the state. In north–west side, Kangra and in the west Hamirpur and Bilaspur districts are located. Solan and Shimla districts are on the southern and Kullu district on the eastern side. Administratively, the district is divided into six sub-divisions, nine tehsils and ten developmental blocks. The district has areas ranging from low lying sub-tropical to higher mountains making it possible to grow a variety of field crops and fruits and undertake livestock enterprises.

The district has 3950.58 sq km geographical area which constitutes around 7 percent of the total geographical area of the state, out of which 94660 ha. is culturable, 27136 ha. is barren and unculturable, 105262 ha. is cultivable waste and the rest of the land which comes to 168000 ha. is under forest cover. Topographically, the district can be divided into two main categories, a) Shivalik (Outer Himalaya) region; the Balh valley, Baldwara and Joginder Nagar area of Mandi district ranging from 651 to 1500 m amsl fall in this region. Deep to shallow stone embedded with loam to clay soils are found in this zone. The paddy, maize, ginger, wheat, potato and citrus fruit are cultivated in this area. b) Mid mountain (Inner Himalaya) region; areas of Chachiot, Karsog, Seraj and part of Drang blocks (1500-4500 m amsl) fall in this region. The soil of the district is mainly neutral and varies from clay loam to sandy loam, sandy and rocky in texture. Average rainfall of the district is 1625 mm. The maximum temperature exceeds 35 °C during summer in the lower and mid hill and minimum temperature sometime goes down below 0 °C in winter in the upper reaches of the district. As per the statistics, about 33.52% area of the District constitutes wasteland, and as such provides good scope for implementation of watershed project. Mandi falls in the mid-hills-sub-humid zone and high hills temperate wet agro climatic zone of Himachal Pradesh. The district receives the highest rainfall in the state and the annual average rainfall over the 15 years is 1239.98 mm. The rainfall varies in between 1000 to 2376 mm in the district. Maximum rainfall occurs in the month of June to September followed by January to March whereas least rainfall occurs in the month of November followed by December, October and April. About 63 percent rainfall occurs in monsoon season i.e. from June to September and rest of the precipitation occurs due to western disturbances. Lower areas of the district experience hot summer (up to 40 °C temp.) and cold winter with frost and fog. Hilly area experiences mild summer and cold winter with low to high snowfall and mist in rainy season.

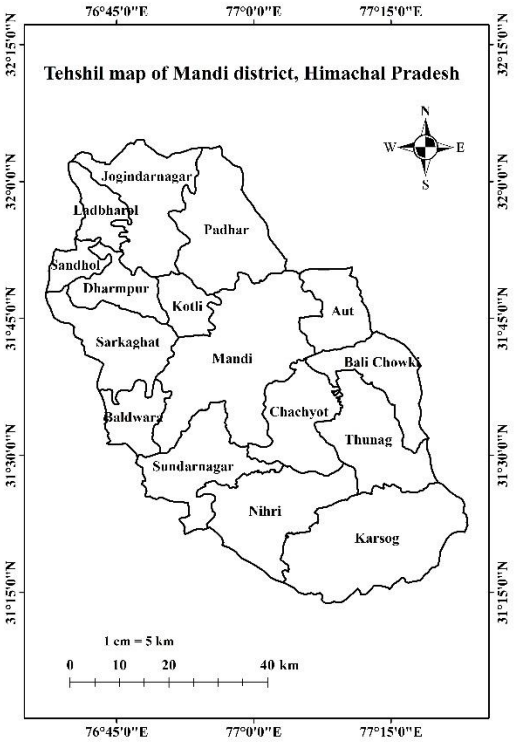


Fig. 1 Map of district Mandi

Methodology

To conduct the survey a questionnaire was developed by experts of CSIR-IHBT Palampur according to the guidelines provided by the Department of Forest for collecting data. To undertake the survey of each VFDS, teams comprising of an expert in the area of agriculture, field survey, taxonomist along with the members of forest team and facilitators of JICA were formed. The technical teams did the transect walk through various villages of VFDS to assess the potential medicinal and aromatic plants suitable for cultivation in particular panchayat/VFDS, met with farmers' and forest officials. The collected data were analyzed and compiled panchayat wise and mentioned below.

1. Range Dharampur; VFDS: Tanehar

Cluster:	Mandi	**Range:**	Dharampur
VFDS:	**Torjajar**	**Panchayat:**	**Tanehar**
GPS coordinates:	31°49′20″N, 76°44′05″E	**Altitude:**	1070 to 1122 m amsl

Tanehar village is located in Dharampur Block of Mandi district. The altitude varied from 1070 to 1122 meter above mean sea level. The chalk area of Tanehar under Sidhpur beat of Dharmpur Range in Jogindernagar Forest Division Management Unit (DMU). These villages are adjacent to each other and surrounded by UPF Deodar. Both the villages are located at a distance of about 2 km from Panchayat office, 4 km from block office, 60 km from DMU office and 55 km from District headquarter. Total geographical area of the panchayat is 989 ha. There are 304 households in the panchayat of which about 24 per cent are below poverty line. Marginal and small farmers constitute about 88.8 per cent and 9.9 per cent of the total farmers, respectively. Cultivated area is about 10% and 90 % are grasslands. Average land holding size is 5-10 bighas (0.4-0.8 ha). Wheat and maize are the main crops. Paddy is also grown in some areas. There are frequent crop failures due to drought. Wild animals *viz*., peacock, boar and monkey destroy the traditional crops in the village. The detail of medicinal and aromatic plants found in the village and the list of suitable plants/crops for cultivation in forest area and at farmers' field are given in the Tables below.

List of medicinal and aromatic plants found in Tanhed panchayat.

Sl. N.	Name of Species	Family	Common Name	Aromatic
1.	*Artemisia absinthium* L.	Asteraceae	Asfantin	+
2.	*Bombax ceiba* L.	Malvaceae	Simbal	
3.	*Cassia fistula* L.	Fabaceae	Amaltas	
4.	*Cuscuta reflexa* Roxb.	Convolvulaceae	Akash Bel	
5.	*Cynodon dactylon* (L.) Pers.	Poaceae	Dub	
6.	*Cyperus rotundus* L.	Cyperaceae	Motha	
7.	*Dalbergia sissoo* DC.	Fabaceae	Sheesham	
8.	*Dioscorea bulbifera* L.	Dioscoreaceae	Tardi	
9.	*Ficus auriculata* Lour.	Moraceae	Fagoora	
10.	*Ficus benghalensis* L.	Moraceae	Vat	
11.	*Ficus religiosa* L.	Moraceae	Pipal	
12.	*Grewia optiva* J.R. Drumm. ex Burret	Malvaceae	Ghaman	
13.	*Justicia adhatoda* L.	Acanthaceae	Bansuti	
14.	*Mallotus philippensis* (Lam.) Müll.Arg.	Euphorbiaceae	Kaamal	
15.	*Mangifera indica* L.	Anacardiaceae	Aam	
16.	*Murraya koenigii* (L.) Spreng	Rutaceae	Kari patta	+
17.	*Oroxylum indicum* (L.) Kurz i	Bignoniaceae	Tatpalang	

18.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
19.	*Ricinus communis* L.	Euphorbiaceae	Arand	
20.	*Sapindus mukorossi* Gaertn.	Sapindaceae	Ritha	
21.	*Syzygium cumini* (L.) Skeels	Myrtaceae	Jamun	
22.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
23.	*Terminalia chebula* Retz.	Combretaceae	Harad	
24.	*Tinospora cordifolia* (Willd.) Miers	Menispermaceae	Giloya	
25.	*Vitex negundo* L.	Lamiaceae	Nirgundi	+
26.	*Zanthoxylum armatum* DC.	Rutaceae	Tirmir	+

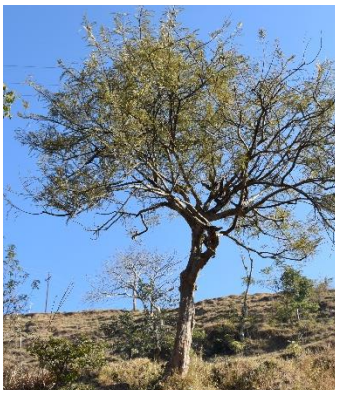
Medicinal and aromatic plant species suitable for cultivation in forest area

Sl. N.	**Name of Species**	**Family**	**Common Name**	**Aromatic**
i.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
ii.	*Sapindus mukorossi* Gaertn.	Sapindaceae	Ritha	
iii.	*Syzygium cumini* (L.) Skeels	Myrtaceae	Jamun	
iv.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
v.	*Terminalia chebula* Retz.	Combretaceae	Harad	
vi.	*Tinospora cordifolia* (Willd.) Miers	Menispermaceae	Giloya	
vii.	*Curcuma aromatic* Salisb.	Zingiberaceae	Jangli haldi	+
viii.	*Hedychium spicatum* Sm.	Zingiberaceae	Kapurkachri	+

Medicinal and aromatic plant species suitable for cultivation in field conditions

Sl. N.	**Name of Species**	**Family**	**Common Name**	**Aromatic**
i.	*Tagetes minuta* L.	Asteraceae	Wild marigold	+
ii.	*Ocimum spp.*	Lamiaceae	Tulsi, Kapoor tulsi	+
iii.	*Cymbopogon flexuosus* (Nees ex Steud). W. Watson	Poaceae	Lemongrass	+
iv.	*Cymbopogon martini* (Roxb.) W. Watson	Poaceae	Palmarosa	+
v.	*Matricaria chamomilla* L.	Asteraceae	Chamomile	+
vi.	*Withania somnifera* (L.) Dunal	Solanaceae	Ashwagandha	

Interaction with farmers at Tanehar panchayat



Phyllanthus emblica

Justicia adhatoda

Mallotus philippensis

Medicinal plants of Tanehar Panchayat

2. Range: Dharampur; VFDS: Langehar

Cluster:	Mandi	**Range:**	Dharampur
VFDS:	**Langehar**	**Panchayat:**	**Langehar**
GPS coordinates:	31°55′18.79″N, 76°44′36.58″E	**Altitude:**	945 to 1142 m

Langehar panchayat is located in Dharampur Block of Mandi district. The panchayat consists of five revenue villages namely Hiun, Baral, Giun, Langehar and Druman. The altitude varied from 945 to 1142 meter above mean sea level. Total geographical area of the panchayat is 756 ha and the treatable area is 723 ha while the irrigated area in the panchayat is 33 ha. There are 411 households in the panchayat of which about 32 per cent are below poverty line. Marginal and small farmers constitute about 90 per cent and 7 per cent of the total farmers, respectively. About 36 per cent of the total population belongs to scheduled castes. Paddy (*Oryza sativa*) in kharif and wheat (*Triticum aestivum*) are the major crops. Most of paddy is grown as upland as there is scarcity of water. Maize (*Zea mays*), blackgram (*Vigna mungo* L.) and barley (*Hordeum vulgare* L.) are also grown but acreage is very less. Maize has been abandoned due to monkey menace. Other crops like turmeric (*Curcuma longa* L.) and ginger (*Zingiber officinalis* L.), colocasia (*Colocasia esculenta* L.), tomato (*Solanum esculentum* L.) and okra (*Abulmoschus esculentus* L.) are also grown in small scale. Wild animals *viz*., peacock, boar and monkey destroy the traditional crops in the village. The detail of medicinal and aromatic plants found in the village and the list of suitable plants/crops for cultivation in forest area and at farmers' field are given in the Tables below.

List of medicinal and aromatic plants found in Langehar

Sl. N.	Name of species	Family	Common Name	Aromatic
1.	*Achyranthes aspera* L.	Amaranthaceae	Latjeera	
2.	*Bauhinia variegata* L.	Fabaceae	Kachnar	
3.	*Berberis lycium* Royle	Berberidaceae	Daruharidra/Kasmal	
4.	*Cassia fistula* L.	Fabaceae	Amaltas	
5.	*Cuscuta reflexa* Roxb.	Convolvulaceae	Akash Bel	
6.	*Cynodon dactylon* (L.) Pers.	Poaceae	Dub	
7.	*Cyperus rotundus*L.	Cyperaceae	Motha	
8.	*Dalbergia sissoo* DC.	Fabaceae	Sheesham	
9.	*Murraya koenigii* (L.) Spreng	Rutaceae	Kari patta	+
10.	*Phoenix sylvestris* (L.) Roxb.	Arecaceae	Khajur	
11.	*Pinus roxburghii* Sargent	pinaceae	Pine	
12.	*Ricinus communis* L.	Euphorbiaceae	Arand	
13.	*Sapindus mukorossi* Gaertn.	Sapindaceae	Ritha	
14.	*Tagetes minuta* L.	Asteraceae	Jangali Genda	+
15.	*Terminalia arjuna* (Roxb.	Combretaceae	Arjun	

	ex DC.) Wight & Arn.			
16.	*Vitex negundo* L.	Lamiaceae	Nirgundi	+
17.	*Woodfordia fruticosa* (L.) Kurz	Lythraceae	Dhatki	
18.	*Ziziphus jujuba* Mill.	Rhamnaceae	Ber	

Medicinal and aromatic plant species suitable for cultivation in forest area

Sl. N.	**Name of Species**	**Family**	**Common Name**	**Aromatic**
i.	*Valeriana jatamansi* L.	Valerianaceae	Mushkbala	+
ii.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
iii.	*Sapindus mukorossi* Gaertn.	Sapindaceae	Ritha	
iv.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
v.	*Terminalia chebula* Retz.	Combretaceae	Harad	
vi.	*Curcuma aromatica*	Zingiberaceae	Jangli haldi	+
vii.	*Hedychium spicatum*	Zingiberaceae	Kapurkachri	

Medicinal and aromatic plant species suitable for cultivation in field conditions

Name of Species	**Family**	**Common Name**	**Aromatic**
Tagetes minuta L.	Asteraceae	Wild marigold	+
Valeriana jatamansi Jones.	Valerianaceae	Mushkbala	+
Rosa damasena Mill.	Rosaceae	Damask rose	+
Rosmarinus officinalis L.	Lamiaceae	Rosemary	+
Pelargonium graveolens	Geraniaceae	Scented geranium	+

Interaction with farmers

Site for conservation of medicinal and aromatic plants

3. Range: Ladhbharol; VFDS: Khudi

Cluster:	Mandi	**Range:**	Ladbharol
VFDS:	Khudi	**Panchayat:**	Khudi
GPS coordinates:	31°55′18.79″N, 76°44′36.58″E	**Altitude:**	1360 m

Khudi village is located in Lad Bharol Tehsil of Mandi district in Himachal Pradesh, India. It is situated 81km away from district headquarter. The total geographical area of village is 35.57 hectares. Khudi has a total population of 115 peoples. There are about 33 houses in Khuddi village**.** The area is rainfed. Maize, paddy, wheat, barley, colocasia are the important crops grown in the village. There is animal menace particularly from peacock. The detail of medicinal and aromatic plants found in the village and the list of suitable plants/crops for cultivation in forest area and at farmers' field are given in the Tables below.

List of medicinal and aromatic plants found in Khudi.

Sl. N.	Name of Species	Family	Common Name	Aromatic
1.	*Aegle marmelos* (L.) Corrêa	Rutaceae	Bel	
2.	*Artemisia absinthium*	Asteraceae	Asfantin	+
3.	*Bombaxceiba* L.	malvaceae	Simbal	
4.	*Cannabis sativa* L.	Cannabaceae	Bhang	
5.	*Carissa spinarum* L.	Apocynaceae	Garna	
6.	*Cassia fistula* L.	Fabaceae	Amaltas	
7.	*Cinnamomum tamala* (Buch.-Ham.) T.Nees & Eberm.	Lauraceae	Tejpatta	+
8.	*Citrus jambhiri* Lush.	Rutaceae	Dhamiradi	
9.	*Cordia myxa* L.	Boraginaceae	Lasuda	
10.	*Curcuma longa* L.	Zingiberaceae	Haldi	
11.	*Cuscuta reflexa* Roxb.	Convolvulaceae	Akash Bel	
12.	*Cynodon dactylon* (L.) Pers.	Poaceae	Dub	
13.	*Cyperus rotundus* L.	Cyperaceae	Motha	
14.	*Dalbergia sissoo* DC.	Fabaceae	Sheesham	
15.	*Datura stramonium* L.	Solanaceae	Dhatura	
16.	*Dioscorea bulbifera* L.	Dioscoreaceae	Tardi	
17.	*Ficus auriculata* Lour.	Moraceae	Fagoora	
18.	*Grewia optiva* J.R. Drumm. ex Burret	Malvaceae	Ghaman	
19.	*Justicia adhatoda* L.	Acanthaceae	Bansuti	
20.	*Mallotus philippensis* (Lam.) Müll.Arg.	Euphorbiaceae	Kaamal	
21.	*Mentha spicata* L.	Lamiaceae	Podina	+
22.	*Murraya koenigii* (L.) Spreng	Rutaceae	Kari patta	+
23.	*Oroxylum indicum* (L.) Kurzi	Bignoniaceae	Tatpalang	

24.	*Phoenix sylvestris* (L.) Roxb.	Arecaceae	Khajur	
25.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
26.	*Prunus amygdalus* Batsch	Rosaceae	Badam	
27.	*Prunus armeniaca* L.	Rosaceae	Khumani	
28.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
29.	*Terminalia chebula* Retz.	Combretaceae	Harad	
30.	*Tinospora cordifolia* (Willd.) Miers	Menispermaceae	Giloya	
31.	*Viola pilosa* Blume	Violaceae	Vanfasha	
32.	*Woodfordia fruticosa* (L.) Kurz	Lythraceae	Dhatki	

Medicinal and aromatic plant species suitable for cultivation in Khudi forest area

Sl. N.	Name of Species	Family	Common Name	Aromatic
i.	*Valeriana jatamansi*	Valerianaceae	Mushkbala	
ii.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
iii.	*Sapindus mukorossi* Gaertn.	Sapindaceae	Ritha	
iv.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
v.	*Terminalia chebula* Retz.	Combretaceae	Harad	
vi.	*Curcuma aromatica* Salisb.	Zingiberaceae	Jangli haldi	+
vii.	*Hedychium spicatum* Sm.	Zingiberaceae	Kapurkachri	+

Medicinal and aromatic plant species suitable for cultivation in Khudi under field conditions

Sl. N.	Name of Species	Family	Common Name	Aromatic
i.	*Tagetes minuta*	Asteraceae	Wild marigold	+
ii.	*Valeriana jatamansi*	Valerianaceae	Mushkbala	+
iii.	*Rosa damascena* Mill.	Rosaceae	Damask rose	+
iv.	*Rosmarinus officinalis*	Lamiaceae	Rosemary	+
v.	*Pelargonium graveolens*	Geraniaceae	Scented geranium	+
vi.	*Viola odorata*	Violaceae	Banafsa	

Interaction with farmers at Khudi Panchayat

Site for conservation of MAPs at Khudi

4. Range: Ladbhrol; VFDS: Ropari Kalheru

Cluster:	Mandi	**Range:**	Ladbharol
VFDS:	Ropari Kalheru	**Panchayat:**	Ropari Kalheru
GPS coordinates:	31°55′56.60″N, 76°45′37.01″E	**Altitude:**	1100 m-1412 m

Ropari Kalheru VFDS is situated at 1100-1400 m amsl in Labharol range of district Mandi. Village is south facing and have sufficient sunlight during the whole day. The soil of the area is poorly terraced, texture in general varies from loam to sandy loam. Climate of the area is subtropical climate, hot during summer season. The area is rainfed and dependent on rainfall. The farmers do not medicinal and aromatic crops. There is animal menace particularly from peacock.The main food grain crops grown in the village are maize, paddy, wheat, barley. The detail of medicinal and aromatic plants found in the village and the list of suitable plants/crops for cultivation in forest area and at farmers' field are given in the Tables below.

List of medicinal and aromatic plants found in Ropari Kalheru.

Sl. N.	Name of Species	Family	Common Name	Aromatic
1.	*Achyranthes aspera* L.	Amaranthaceae	Latjeera	
2.	*Artemisia absinthium L.*	Asteraceae	Asfantin	+
3.	*Asparagus adscendens* Roxb.	Asparagaceae	Satavari	
4.	*Berberis lycium* Royle	Berberidaceae	Daruharidra	
5.	*Cinnamomum tamala* (Buch.-Ham.) T. Nees & Eberm.	Lauraceae	Tejpatta	+
6.	*Cynodon dactylon* (L.) Pers.	Poaceae	Dub	
7.	*Cyperus rotundus* L.	Cyperaceae	Motha	
8.	*Dioscorea bulbifera* L.	Dioscoreaceae	Tardi	
9.	*Ficus auriculata* Lour.	Moraceae	Fagoora	
10.	*Ficus religiosa* L.	Moraceae	Pipal	
11.	*Mallotus philippensis* (Lam.) Müll.Arg.	Euphorbiaceae	Kaamal	
12.	*Murraya koenigii* (L.) Spreng	Rutaceae	Kari patta	+
13.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
14.	*Pinus roxburghii* Sargent	pinaceae	Pine	
15.	*Punica granatum* L.	Lythraceae	Dadim	
16.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
17.	*Terminalia chebula* Retz.	Combretaceae	Harad	
18.	*Viola pilosa* Blume	Violaceae	Vanfasha	
19.	*Vitex negundo* L.	Lamiaceae	Nirgundi	+

Medicinal and aromatic plant species suitable for cultivation in forest area

Sl. N.	Proposed MAPs Species	Family	Common Name	Aromatic
1.	*Valeriana jatamansi* Jones.	Valerianaceae	Mushkbala	+
2.	*Curcuma aromatic* Salisb.	Zingiberaceae	Jangali Haldi	+
3.	*Hedychium spicatum* Buch. Ham. ex Smith.	Zingiberaceae	Kapoor Kachari	+
4.	*Punica granatum* L.	Lythraceae	Dadim	
5.	*Viola odorata*	Violaceae	Banafsa	+

Medicinal and aromatic plant species suitable for cultivation in farmers' field conditions

Sl. N.	Proposed MAPs Species	Family	Common Name	Aromatic
1.	*Tagetes minuta* L.	Asteraceae	Wild marigold	+
2.	*Rosmarinus officinalis*	Lamiaceae	Rosemary	+
3.	*Valeriana jatamansi* Jones.	Valerianaceae	Mushkbala	+
4.	*Matricaria chamomilla* L.	Asteraceae	Chamomile	+
5.	*Rosa damascena* Mill.	Rosaceae	Damask rose	+
6.	*Pelargonium graveolens L.*	Geraniaceae	Rose geranium	+

Interaction with villagers and forest officials at Ropari Kalheru

Site for conservation of MAPs at Ropari Kalheru

Field survey activities at Ropri Kalheru

5. Range: Kamlah; VFDS: Beri

Cluster:	Mandi	**Range:**	Kamlah
VFDS:	Beri	**Panchayat:**	Beri (Upper)
GPS coordinates:	31°52′25.10″N,76°41′12.36″E	**Altitude:**	778 m

Beri village is situated at an altitude of 778 m amsl. Village have population of 1500 population and about 200 houses. The soil of the area is dry and rocky soil, gravel shallow, poorly terraced, texture in general varies from loam to sandy loam, except in low valley areas being heavy textured. Climate of the area is subtropical climate, hot during summer season. The area is rainfed and dependent on rainfall except for few locations. The main food grain crops grown in the village are maize, paddy wheat, barley. Beside these cereal crops, some of the farmers also grow pulses *viz*., pigeon peas, black gram beans, soybean, ginger, turmeric. The detail of medicinal and aromatic plants found in the village and the list of suitable plants/crops for cultivation in forest area and at farmers' field are given in the Tables below.

List of wild medicinal plants growing at Upper Beri Village

Sl. No.	Name of Species	Family	Common Name	Aromatic
1.	*Acacia catechu* (L.f.) Willd.	Fabaceae	Khair	
2.	*Achyranthes bidentata* Blume	Amaranthaceae	Amamarg	
3.	*Albizia chinensis* (Osbeck) Merr.	Fabaceae	Sirish	
4.	*Asparagus adscendens* Roxb.	Asparagaceae	Satavari	
5.	*Bauhinia variegata* L.	Fabaceae	Kachnar	
6.	*Bombax ceiba* L.	Malvaceae	Simbal	
7.	*Carissa spinarum* L.	Apocynaceae	Garna	
8.	*Cassia fistula* L.	Fabaceae	Amaltas	
9.	*Cissampelos pareira* L.	Menispermaceae	Bhatindu	
10.	*Clematis gouriana* Roxb. ex DC.	Ranunculaceae	-	
11.	*Cuscuta reflexa* Roxb.	Convolvulaceae	Akash Bel	
12.	*Dalbergia sissoo* DC.	Fabaceae	Sheesham	
13.	*Erythrina variegata* L.	Fabaceae	Paribhadra	
14.	*Ficus auriculata* Lour.	Moraceae	Fagoora	
15.	*Ficus benghalensis* L.	Moraceae	Vat	
16.	*Ficus hispida* L.f.	Moraceae		
17.	*Grewia optiva* J.R.Drumm. ex Burret	Malvaceae	Ghaman	
18.	*Justicia adhatoda* L.	Acanthaceae	Bansuti	
19.	*Mallotus philippensis* (Lam.) Müll.Arg.	Euphorbiaceae	Kaamal	
20.	*Murraya koenigii* (L.) Spreng	Rutaceae	Kari patta	+
21.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
22.	*Pinus roxburghii* Sargent	Pinaceae	Pine	

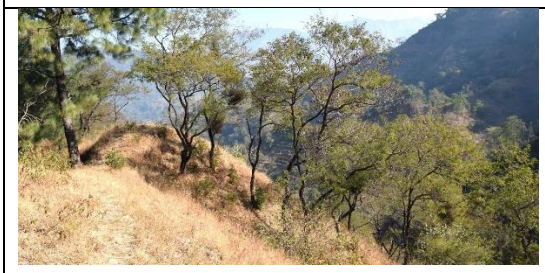
23.	*Pyrus pashia* Buch.-Ham. ex D.Don	Rosaceae	Kaith	
24.	*Sapindus mukorossi* Gaertn.	Sapindaceae	Ritha	
25.	*Syzygium cumini* (L.) Skeels	Myrtaceae	Jamun	
26.	*Terminalia arjuna* (Roxb. ex DC.) Wight & Arn.	Combretaceae	Arjun	
27.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
28.	*Terminalia chebula* Retz.	Combretaceae	Harad	
29.	*Thalictrum foliolosum* DC.	Ranunculaceae	Mamiri	
30.	*Tinospora cordifolia* (Willd.) Miers	Menispermaceae	Giloya	
31.	*Vitex negundo* L.	Lamiaceae	Nirgundi	+
32.	*Woodfordia fruiticosa* L. Kurz	Lythraceae	Ghaatki	
33.	*Ziziphus jujuba* Mill.	Rhamnaceae	Ber	

Medicinal and aromatic plant species suitable for cultivation and conservation in Beri forest area

Name of Species	**Family**	**Common Name**	**Aromatic**
Phyllanthus emblica L.	Phyllanthaceae	Amla	
Terminalia bellirica (Gaertn.) Roxb.	Combretaceae	Baheda	
Terminalia chebula Retz.	Combretaceae	Harad	
Terminalia arjuna (Roxb. ex DC.) Wight & Arn.	Combretaceae	Arjun	

Medicinal and aromatic plant species suitable for cultivation in Beri under field conditions

Name of Species	**Family**	**Common Name**	**Aromatic**
Tagetes minuta L.	Asteraceae	Wild marigold	+
Cymbopogon flexuosus (Nees ex Steud). W. Watson	Poaceae	Lemongrass	+
Cymbopogon martini (Roxb.) W. Watson	Poaceae	Palmarosa	+
Aloe barbadensis Mill.	Asphodelaceae	Aloevera	
Ocimum spp.	Lamiaceae	Tulsi, Kapoor tulsi	+
Withania somnifera (L.) Dunal	Solanaceae	Ashwagandha	

 Interaction with forest officials	 Interaction with farmers
 Proposed site for conservation of MAPs	 Proposed site for conservation of MAPs

GLIMPSE OF FIELD AND FIELD ACTIVITIES

6. Range: Kamlah; VFDS: Sari

Cluster:	Mandi	**Range:**	Kamlah
VFDS:	Sari	**Panchayat:**	Sari
GPS coordinates:	31°47′22.29″N, 76°41′56.27″E	**Altitude:**	741

Sari village is situated at an altitude of 741 m amsl. Village have population of 1400 population and about 200 houses. The soil of the area is dry and rocky soil, gravel shallow, poorly terraced, texture in general varies from loam to sandy loam, except in low valley areas being heavy textured. Climate of the area is subtropical climate, hot during summer season. The area is rainfed and dependent on rainfall except for few locations. The main food grain crops grown in the village are maize, paddy wheat, barley. Beiside these cereal crops, some of the farmers also grow pulses *viz*., pigeon peas, black gram beans, soyabean, ginger, turmeric. The detail of medicinal and aromatic plants found in the village and the list of suitable plants/crops for cultivation in forest area and at farmers' field are given in the Tables below.

List of wild medicinal plants growing at Sari Village

Sl. No.	Name of Species	Family	Common Name	Aromatic
1.	*Acacia catechu* (L.f.) Willd.	Fabaceae	Khair	
2.	*Bauhinia variegata* L.	Fabaceae	Kachnar	
3.	*Berberis lycium* Royle	Berberidaceae	Daruharidra	
4.	*Bombax ceiba* L.	Malvaceae	Simbal	
5.	*Cannabis sativa* L.	Cannabaceae	Bhang	
6.	*Carissa spinarum* L.	Apocynaceae	Garna	
7.	*Cassia fistula* L.	Fabaceae	Amaltas	
8.	*Cuscuta reflexa* Roxb.	Convolvulaceae	Akash Bel	
9.	*Dioscorea bulbifera* L.	Dioscoreaceae	Tardi	
10.	*Erythrina variegata* L.	Fabaceae	Paribhadra	
11.	*Ficus religiosa* L.	Moraceae	Pipal	
12.	*Ficus hispida* L.f.	Moraceae		
13.	*Grewia optiva* J.R.Drumm. ex Burret	Malvaceae	Ghaman	
14.	*Justicia adhatoda* L.	Acanthaceae	Bansuti	
15.	*Mallotus philippensis* (Lam.) Müll.Arg.	Euphorbiaceae	Kaamal	
16.	*Mangifera indica* L.	Anacardiaceae	Aam	
17.	*Murraya koenigii* (L.) Spreng	Rutaceae	Kari patta	+
18.	*Phoenix sylvestris* (L.) Roxb.	Arecaceae	Khajur	
19.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
20.	*Pinusroxburghii* Sargent	Pinaceae	Pine	
21.	*Sapindus mukorossi* Gaertn.	Sapindaceae	Ritha	
22.	*Syzygium cumini* (L.) Skeels	Myrtaceae	Jamun	
23.	*Terminalia arjuna* (Roxb. ex DC.) Wight & Arn.	Combretaceae	Arjun	
24.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	

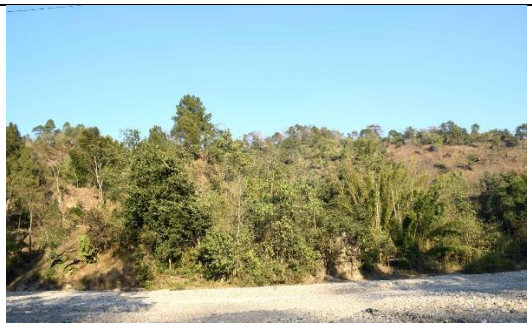
25.	*Terminalia chebula* Retz.	Combretaceae	Harad	
26.	*Vitex negundo* L.	Lamiaceae	Nirgundi	+
27.	*Woodfordia fruiticosa* L. Kurz	Lythraceae	Ghaatki	

Medicinal and aromatic plant species suitable for cultivation and conservation in Sari forest area

Sl. N.	Name of Species	Family	Common Name	Aromatic
i.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
ii.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
iii.	*Terminalia chebula* Retz.	Combretaceae	Harad	
iv.	*Terminalia arjuna* (Roxb. ex DC.) Wight & Arn.	Combretaceae	Arjun	

Medicinal and aromatic plant species suitable for cultivation in Sari under field conditions

Sl. N.	Name of Species	Family	Common Name	Aromatic
1	*Cymbopogon flexuosus* (Nees ex Steud). W. Watson	Poaceae	Lemongrass	+
2	*Cymbopogon martini* (Roxb.) W. Watson	Poaceae	Palmarosa	+
3	*Aloe barbadensis* Mill.	Asphodelaceae	Aloevera	
4	*Ocimum spp.*	Lamiaceae	Tulsi	+
5	*Withania somnifera* (L.) Dunal	Solanaceae	Ashwagandha	

 Interaction with forest officials	 Proposed site for conservation of MAPs
 Proposed site for conservation of MAPs	 Proposed site for conservation of MAPs

GLIMPSE OF FIELD AND FIELD ACTIVITIES

7. Range: Suket; VFDS: Riggad

Cluster:	Mandi	**Range:**	Suket
VFDS:	Riggad	**Panchayat:**	Kehar
GPS coordinates:	31°35′56.23″N,76°59′09.92″E	**Altitude:**	778-1140 m

Riggad VFDS is situated at an altitude of 778-1140 m amsl. Village have population of 1500 population and about 200 houses. The soil of the area is dry, rocky and sandy gravel, poorly terraced, texture in general varies from loam to sandy loam, except in low valley areas being heavy textured. Climate of the area is subtropical climate, hot during summer season. The area is rainfed and dependent on rainfall except for few locations. While very few areas are irrigated by water tank. The main food grain crops grown in the village are maize and wheat. Apart from this some farmers also growing, cauliflower and radish. The detail of medicinal and aromatic plants found in the village and the list of suitable plants/crops for cultivation in forest area and at farmers' field are given in the Tables below.

List of wild MAPs plants growing at Riggad

Sl. No.	Name of Species	Family	Common Name	Aromatic
1.	*Aegle marmelos* (L.) Corrêa	Rutaceae	Bel	
2.	*Albizia chinensis* (Osbeck) Merr.	Fabaceae	Sirish	
3.	*Artemisia vestita* Wall. ex Besser	Asteraceae	-	+
4.	*Bauhinia variegata* L.	Fabaceae	Kachnar	
5.	*Berberis lycium* Royle	Berberidaceae	Daruharidra	
6.	*Bombax ceiba* L.	malvaceae	Simbal	
7.	*Carissa spinarum* L.	Apocynaceae	Garna	
8.	*Dalbergia sissoo* DC.	Fabaceae	Sheesham	
9.	*Dioscorea bulbifera* L.	Dioscoreaceae	Tardi	
10.	*Ficus religiosa* L.	Moraceae	Pipal	
11.	*Grewia optiva* J.R.Drumm. ex Burret	Malvaceae	Ghaman	
12.	*Mallotus philippensis* (Lam.) Müll.Arg.	Euphorbiaceae	Kaamal	
13.	*Mangifera indica* L.	Anacardiaceae	Aam	
14.	*Murraya koenigii* (L.) Spreng	Rutaceae	Kari patta	+
15.	*Myrica esculenta* Buch.-Ham. ex D. Don	Myriaceae	Kafal	
16.	*Oroxylum indicum* (L.) Kurz i	Bignoniaceae	Tatpalang	
17.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
18.	*Pinus roxburghii* Sargent	Pinaceae	Pine	
19.	*Pistacia integerrima* J. L. Stewart ex Brandis		-	

20.	*Punica granatum* L.	Lythraceae	Dadim	
21.	*Sapindus mukorossi* Gaertn.	Sapindaceae	Ritha	
22.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
23.	*Terminalia chebula* Retz.	Combretaceae	Harad	
24.	*Tinospora cordifolia* (Willd.) Miers	Menispermaceae	Giloya	
25.	*Viola pilosa* Blume	Violaceae	Vanfasha	
26.	*Vitex negundo* L.	Lamiaceae	Nirgundi	+
27.	*Zanthoxylum armatum* DC.	Rutaceae	Tirmir	+

Medicinal and aromatic plant species suitable for cultivation and conservation in Kehar forest area

Name of Species	Family	Common Name	Aromatic
Phyllanthus emblica L.	Phyllanthaceae	Amla	
Terminalia bellirica (Gaertn.) Roxb.	Combretaceae	Baheda	
Terminalia chebula Retz.	Combretaceae	Harad	
Terminalia arjuna (Roxb. ex DC.) Wight & Arn.	Combretaceae	Arjun	

Medicinal and aromatic plant species suitable for cultivation in Kehar under field conditions

Name of Species	Family	Common Name	Aromatic
Cymbopogon flexuosus (Nees ex Steud). W. Watson	Poaceae	Lemongrass	+
Cymbopogon martini (Roxb.) W. Watson	Poaceae	Palmarosa	+
Tagetes minuta L.	Asteraceae	Wild marigold	+
Aloe barbadensis Mill.	Asphodelaceae	Aloevera	
Withania somnifera (L.) Dunal	Solanaceae	Ashwagandha	
Ocimum spp.	Lamiaceae	Tulsi	+

 Interaction with forest officials and farmers	 Proposed site for conservation of MAPs

GLIMPSE OF FIELD AND FIELD ACTIVITIES

8. Range: Suket; VFDS: Thalla

Cluster:	Mandi	**Range:**	Suket
VFDS:	Thalla	**Panchayat:**	Arthi
GPS coordinates:	31°31′13.33″N, 76°52′05.11″E	**Altitude:**	986 m

Arthi village is situated at an altitude of 986 m amsl. The soil of the area is dry and rocky soil, gravel shallow, poorly terraced, texture in general varies from loam to sandy loam, except in low valley areas being heavy textured. Climate of the area is subtropical climate, hot during summer season. The area is rainfed and mostly dependent on rainfall except for few locations. The main food grain crops grown in the village are maize and wheat. There is animal menace from monkey, pig and wild boar etc. The area is rainfed and dependent on rainfall except for few locations. The main food grain crops grown in the village are maize, paddy and wheat, barley. The detail of medicinal and aromatic plants found in the village and the list of suitable plants/crops for cultivation in forest area and at farmers' field are given in the Tables below.

List of wild MAPs plants growing at Thalla

Sl. No.	Name of Species	Family	Common Name	Aromatic
1.	*Albizia chinensis* (Osbeck) Merr.	Fabaceae	Sirish	
2.	*Bauhinia variegata* L.	Fabaceae	Kachnar	
3.	*Bombax ceiba* L.	Malvaceae	Simbal	
4.	*Carissa spinarum* L.	Apocynaceae	Garna	
5.	*Dalbergia sissoo* DC.	Fabaceae	Sheesham	
6.	*Dioscorea bulbifera* L.	Dioscoreaceae	Tardi	
7.	*Ficus religiosa* L.	Moraceae	Pipal	
8.	*Grewia optiva* J.R. Drumm. ex Burret	Malvaceae	Ghaman	
9.	*Mallotus philippensis* (Lam.) Müll.Arg.	Euphorbiaceae	Kaamal	
10.	*Mangifera indica* L.	Anacardiaceae	Aam	
11.	*Murraya koenigii* (L.) Spreng	Rutaceae	Kari patta	+
12.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
13.	*Pinus roxburghii* Sargent	Pinaceae	Pine	
14.	*Pistacia integerrima* J. L. Stewart ex Brandis	Anacardiaceae	Kakde, Karkat	
15.	*Solanum solonaceum* Druce	Solanaceae		
16.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
17.	*Terminalia chebula* Retz.	Combretaceae	Harad	
18.	*Viola pilosa* Blume	Violaceae	Vnafasha	
19.	*Vitex negundo* L.	Lamiaceae	Nirgundi	+

20.	*Asparagus adscendens* Roxb.	Asparagaceae	Satavari	
21.	*Cissampelos pareira* L.	Menispermaceae	Bhanindu	
22.	*Clematis gouriana* Roxb. ex DC.	Ranunculaceae	-	
23.	*Ficus auriculata* Lour.	Moraceae	Fagoora	
24.	*Justicia adhatoda* L.	Acanthaceae	Bansuti	
25.	*Pyrus pashia* Buch. -Ham. ex D. Don	Rosaceae	Kaith	
26.	*Solanum surattense* Burm. f.	Solanaceae	-	
27.	*Toona ciliata* M.Roem.	Meliaceae	Toon	
28.	*Woodfordia fruiticosa* L. Kurz	Lythraceae	Ghaatki	
29.	*Xylosma longifolia* Clos	Salicaeae	-	

Medicinal and aromatic plant species suitable for cultivation and conservation in Thalla

Name of Species	Family	Common Name	Aromatic
Phyllanthus emblica L.	Phyllanthaceae	Amla	
Terminalia bellirica (Gaertn.) Roxb.	Combretaceae	Baheda	
Terminalia chebula Retz.	Combretaceae	Harad	
Terminalia arjuna (Roxb. ex DC.) Wight & Arn.	Combretaceae	Arjun	

Medicinal and aromatic plant species suitable for cultivation in Arthi under field conditions

Name of Species	Family	Common Name	Aromatic
Cymbopogon flexuosus (Nees ex Steud). W. Watson	Poaceae	Lemongrass	+
Cymbopogon martini (Roxb.) W. Watson	Poaceae	Palmarosa	+
Tagetes minuta L.	Asteraceae	Wild marigold	+
Aloe barbadensis Mill.	Asphodelaceae	Aloevera	
Ocimum spp.	Lamiaceae	Tulsi	+

	
Interaction with forest officials and villagers	Proposed site for conservation of MAPs

GLIMPSE OF FIELD AND FIELD ACTIVITIES

9. Range: Darang; VFDS: Nihaun

Cluster:	Mandi	**Range:**	Darang
VFDS:	Nihaun	**Panchayat:**	Kufri
GPS coordinates:	31º 43᾽10.50᾽᾽ N, 076º 51᾽24.48᾽᾽ E	**Altitude:**	1070 m

Nihaun VFDS is situated at an altitude of 1070 m amsl. The village is located about 18 km from Pathankot- Mandi NH154 and 38 km from Mandi town. It has about 20 households having 150 populations. The main occupation of people is agriculture. The soil of area is sandy. Climate of the area is hot during summer and cold in winter. The topography of the area is sloppy so agriculture is entirely rainfed. The main agriculture crops grown in the area are wheat, maize, kodra (*Elusine sp*.), pulses (horse gram, black gram) and vegetables. The detail of medicinal and aromatic plants found in the village and the list of suitable plants/crops for cultivation in forest area and at farmers' field are given in the Tables below.

List of wild medicinal plants growing at Nihaun VFDS

Sl N.	Name of Species	Family	Common Name	Aromatic
1.	*Aegle marmelos* (L.) Corrêa	Rutaceae	Bel	
2.	*Albizia chinensis* (Osbeck) Merr.	Fabaceae	Oei	
3.	*Asparagus adscendens* Roxb.	Asparagaceae	Sansva	
4.	*Bauhinia variegata* L.	Fabaceae	Kachnar	
5.	*Berberis lycium* Royle	Berberidaceae	Kashmal	
6.	*Bombax ceiba* L.	Malvaceae	Simbal	
7.	*Carissa spinarum* L.	Apocynaceae	Garna	
8.	*Cissampelos pareira* L.	Menispermaceae	Batindu	
9.	*Cuscuta reflexa* Roxb.	Convolvulaceae	Akash Bel	
10	*Ficus auriculata* Lour.	Moraceae	Fagoora	
11	*Oroxylum indicum* (L.) Kurz	Bignoniaceae	Tatpalang	
12	*Murraya koenigii* (L.) Spreng	Rutaceae	Kari patta	+
13	*Pistacia integerrima* J. L. Stewart ex Brandis	Anacardiaceae	Kakrsinghi	
14	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
15	*Punica granatum* L.	Lythraceae	Anar	
16	*Sapindus mukorossi* Gaertn.	Sapindaceae	Ritha	
17	*Sida cordifolia* L.	Malvaceae	Bala	
18	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
19	*Terminalia chebula* Retz.	Combretaceae	Harad	
20	*Tinospora cordifolia* (Willd.) Miers	Menispermaceae	Giloya	
21	*Vitex negundo* L.	Lamiaceae	Nirgundi	+
22	*Woodfordia fruiticosa* L. Kurz	Lythraceae	Ghaatki	
23	*Zanthoxylum armatum* DC.	Rutaceae	Tirmira	+

24	*Ziziphus nummularia* (Burm.f.) Wight & Arn.	Rhamnaceae	Barar	

Medicinal and aromatic plant species suitable for cultivation and conservation in Nihaun forest area

Sl. N.	Name of Species	Family	Common Name	Aromatic
i.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
ii.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
iii.	*Terminalia chebula* Retz.	Combretaceae	Harad	

Medicinal and aromatic plant species suitable for cultivation in Nihaun under field conditions

Sl. N.	Name of Species	Family	Common Name	Aromatic
1	*Tagetes minuta* L.	Asteraceae	Wild marigold	+
2	*Cymbopogon flexuosus* (Nees ex Steud). W. Watson	Poaceae	Lemongrass	+
3	*Cymbopogon martini* (Roxb.) W. Watson	Poaceae	Palmarosa	+
4	*Matricaria chamomilla* L.	Asteraceae	Chamomile	+
5	*Aloe barbadensis* Mill.	Asphodelaceae	Aloevera	

Interaction with peoples at Nihaun and proposed site for plantation

10.Range: Darang; VFDS: Kufri

Cluster:	Mandi	**Range:**	Darang
VFDS:	Kufri	**Panchayat:**	Kufri
GPS coordinates:	31º 51ʾ0.87ʾʾN, 76º 52ʾ8.08ʾʾE	**Altitude:**	1456 m

Kufri village is situated at an altitude of 1456 m amsl. The village is located about 15 km from Pathankot- Mandi NH154 and 35 km from Mandi town. It has about 75 households having 300 populations. The main occupation of people is agriculture. The soil of area is sandy loam. Climate of the area is hot during summer and cold in winter. The topography of the area is sloppy so agriculture is entirely rainfed. The main agriculture crops grown in the area are wheat, maize, Kodra (*Elusine sp*.), pulses (horse gram, black gram) and vegetables. The detail of medicinal and aromatic plants found in the village and the list of suitable plants/crops for cultivation in forest area and at farmers' field are given in the Tables below.

List of wild medicinal plants growing at Kufri VFDS

Sr No.	Name of Species	Family	Common Name	Aromatic
1.	*Albizia chinensis* (Osbeck) Merr.	Fabaceae	Oei	
2.	*Asparagus adscendens* Roxb.	Asparagaceae	Sansva	
3.	*Bauhinia variegata* L.	Fabaceae	Kachnar	
4.	*Berberis lycium* Royle	Berberidaceae	Kashmal	
5.	*Bombax ceiba* L.	Malvaceae	Simbal	
6.	*Carissa spinarum* L.	Apocynaceae	Garana	
7.	*Cissampelos pareira* L.	Menispermaceae	Bhanindu	
8.	*Cuscuta reflexa* Roxb.	Convolvulaceae	Akash Bel	
9.	*Ficus auriculata* Lour.	Moraceae	Fagoora	
10.	*Oroxylum indicum* (L.) Kurz	Bignoniaceae	Tatpalang	
11.	*Murraya koenigii* (L.) Spreng.	Rutaceae	Kari patta	+
12.	*Pistacia integerrima* J. L. Stewart ex Brandis	Anacardiaceae	Kakrsinghi	
13.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
14.	*Sapindus mukorossi* Gaertn.	Sapindaceae	Ritha	
15.	*Sida cordifolia* L.	Malvaceae	Bala	
16.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
17.	*Terminalia chebula* Retz.	Combretaceae	Harad	
18.	*Tinospora cordifolia* (Willd.) Miers	Menispermaceae	Giloya	
19.	*Vitex negundo* L.	Lamiaceae	Nirgundi	+
20.	*Woodfordia fruiticosa* L. Kurz	Lythraceae	Ghaatki	
21.	*Zanthoxylum armatum* DC.	Rutaceae	Tirmira	+

Medicinal and aromatic plant species suitable for cultivation and conservation in Kufri forest area

Sl. N.	Name of Species	Family	Common Name	Aromatic
1	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
2	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
3	*Terminalia chebula* Retz.	Combretaceae	Harad	

Medicinal and aromatic plant species suitable for cultivation in Kufri under field conditions

Sl. N.	Name of Species	Family	Common Name	Aromatic
1	*Tagetes minuta* L.	Asteraceae	Wild marigold	+
2	*Cymbopogon flexuosus* (Nees ex Steud). W. Watson	Poaceae	Lemongrass	+
3	*Ocimum spp.*	Lamiaceae	Tulsi	+
4	*Matricaria chamomilla* L.	Asteraceae	Chamomile	+

Interaction with peoples at Kufri and proposed site for plantation

11.Range: Kataula; VFDS: Bhei

Cluster:	Mandi	**Range:**	Kataula
VFDS:	Bhei	**Panchayat:**	Gharan
GPS coordinates:	31º43′41.9″ N, 77º01′42.80″ E	**Altitude:**	909 m

Bhei village is situated at an altitude of 909 m amsl. The village is situated about 4 km from Mandi-Manali NH and approx.14 km from Mandi town. It has about 54 households. The main occupation of people is agriculture. The soil of area is sandy loam and consisting of slate stone. Climate of the area is dry and hot having subtropical type climate. During the summer season it is very hot. The area is rainfed and dependent on rainfall except for few locations. The main agriculture crops grown in the area are maize, barely (*Hordeum vulgare*), kodra (*Elusine sp*.), pulses (horse gram, black gram) and vegetables. The detail of medicinal and aromatic plants found in the village and the list of suitable plants/crops for cultivation in forest area and at farmers' field are given in the Tables below.

List of wild medicinal plants growing at Bhei VFDS

Sl. No.	Name of Species	Family	Common Name	Aromatic
i.	*Acorus calamus* L.	Acoraceae	Bare	+
ii.	*Bauhinia variegata* L.	Fabaceae	Kachnar	
iii.	*Berberis lycium* Royle	Berberidaceae	Kashmal	
iv.	*Bombax ceiba* L.	Malvaceae	Simbal	
v.	*Carissa spinarum* L.	Apocynaceae	Garna	
vi.	*Cissampelos pareira* L.	Menispermaceae	Batindu	
vii.	*Cuscuta reflexa* Roxb.	Convolvulaceae	Akash Bel	
viii.	*Ficus auriculata* Lour.	Moraceae	Fagoora	
ix.	*Justicia adhatoda* L.	Acanthaceae	Bansuti	
x.	*Murraya koenigii* (L.) Spreng	Rutaceae	Kari patta	+
xi.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
xii.	*Punica granatum* L.	Lythraceae	Anar	
xiii.	*Sapindus mukorossi* Gaertn.	Sapindaceae	Ritha	
xiv.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
xv.	*Terminalia chebula* Retz.	Combretaceae	Harad	
xvi.	*Tinospora cordifolia* (Willd.) Miers	Menispermaceae	Giloya	
xvii.	*Viola canescens Wall.*	Violaceae	Banshfa	
xviii.	*Vitex negundo* L.	Lamiaceae	Nirgundi	+
xix.	*Woodfordia fruiticosa* L. Kurz	Lythraceae	Ghaatki	
xx.	*Zanthoxylum armatum* DC.	Rutaceae	Tirmira	+

Medicinal and aromatic plant species suitable for cultivation and conservation in Bhei forest area

Name of Species	Family	Common Name	Aromatic
Phyllanthus emblica L.	Phyllanthaceae	Amla	
Sapindus mukorossi Gaertn.	Sapindaceae	Ritha	
Terminalia bellirica (Gaertn.) Roxb.	Combretaceae	Baheda	
Terminalia chebula Retz.	Combretaceae	Harad	

Medicinal and aromatic plant species suitable for cultivation in Bhei under field conditions

Name of Species	Family	Common Name	Aromatic
Cymbopogon flexuosus (Nees ex Steud). W. Watson	Poaceae	Lemongrass	+
Cymbopogon martini (Roxb.) W. Watson	Poaceae	Palmarosa	+
Ocimum spp.	Lamiaceae	Tulsi/Kapoor tulsi	+
Matricaria chamomilla L.	Asteraceae	Chamomile	+
Withania somnifera	Solanaceae	Aswagandha	

View of site and interaction with forest officials

12.Range: Kataula; VFDS: Dukhi

Cluster:	Mandi	**Range:**	Kataula
VFDS:	Duhki	**Panchayat:**	Navloye
GPS coordinates:	31°44′92.20″ N, 76°59′83.60″ E	**Altitude:**	1335 m

Duhki village is situated at an altitude of 1335 m amsl. The village is situated about 15 km from Kamand, Mandi. It has about 120 households. The main occupation of people is agriculture. The soil of area is sandy loam and consisting of slate stone. Climate of the area is dry and hot having subtropical type climate. During the summer season it is very hot. The area is rainfed and dependent on rainfall except for few locations. The main agriculture crops grown in the area are maize, wheat, barely (*Hordeum vulgare*), kodra (Elusine sp.), pulses (horse gram, black gram) and vegetables. The detail of medicinal and aromatic plants found in the village and the list of suitable plants/crops for cultivation in forest area and at farmers' field are given in the Tables below.

List of wild medicinal plants growing at Duhki VFDS

Sl. No.	Name of Species	Family	Common Name	Aromatic
i.	*Bauhinia variegata* L.	Fabaceae	Kachnar	
ii.	*Berberis lycium* Royle	Berberidaceae	Kashmal	
iii.	*Bombax ceiba* L.	Malvaceae	Simbal	
iv.	*Cissampelos pareira* L.	Menispermaceae	Batindu	
v.	*Cuscuta reflexa* Roxb.	Convolvulaceae	Akash Bel	
vi.	*Ficus auriculata* Lour.	Moraceae	Fagoora	
vii.	*Justicia adhatoda* L.	Acanthaceae	Bansuti	
viii.	*Murraya koenigii* (L.) Spreng	Rutaceae	Kari patta	
ix.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
x.	*Punica granatum* L.	Lythraceae	Anar	
xi.	*Sapindus mukorossi* Gaertn.	Sapindaceae	Ritha	
xii.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
xiii.	*Terminalia chebula* Retz.	Combretaceae	Harad	
xiv.	*Tinospora cordifolia* (Willd.) Miers	Menispermaceae	Giloya	
xv.	*Viola canescens Wall.*	Violaceae	Banfsa	+
xvi.	*Vitex negundo* L.	Lamiaceae	Nirgundi	
xvii.	*Woodfordia fruiticosa* L. Kurz	Lythraceae	Ghaatki	
xviii.	*Zanthoxylum armatum* DC.	Rutaceae	Timira	

Medicinal and aromatic plant species suitable for cultivation and conservation in Dukhi forest area

Sr No.	Name of Species	Family	Common Name	Aromatic
1	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
2	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
3	*Terminalia chebula* Retz.	Combretaceae	Harad	

Medicinal and aromatic plant species suitable for cultivation in Dukhi under field conditions

Name of Species	Family	Common Name	Aromatic
Tagetes minuta L.	Asteraceae	Wild marigold	+
Rosa damascena Mill.	Rosaceae	Damask rose	+
Rosmarinus officinalis	Lamiceae	Rosemary	+
Matricaria chamomilla L.	Asteraceae	Chamomile	+

View of the proposed site

13.Range: Mandi; VFDS: Mandal

Cluster:	Mandi	**Range:**	Mandi
VFDS:	Mandal	**Panchayat:**	Mandal
GPS coordinates:	31°38′16.28″N,76°55′07.41″E	**Altitude:**	1030 m

Mandal village is situated at an altitude of 1030 m amsl. The village is located about 14 km from Mandi. It has about 50 households having 300 populations. The main occupation of people is agriculture. The soil of area is mid hill laom to clay loam with gravel. Climate of the area is hot during summer and cold in winter. The topography of the area is sloppy so agriculture is entirely rainfed. The main agriculture crops grown in the area are wheat, maize, pulses (horse gram, black gram) and vegetables. The detail of medicinal and aromatic plants found in the village and the list of suitable plants/crops for cultivation in forest area and at farmers' field are given in the Tables below.

List of medicinal and aromatic plants found in Mandal.

Sl. N.	Name of Species	Family	Common Name	Aromatic
1.	*Asparagus adscendens* Roxb.	Asparagaceae	Satavari	
2.	*Bauhinia variegata* L.	Fabaceae	Kachnar	
3.	*Berberis lycium*Royle	Berberidaceae	Daruharidra, Kashmal	
4.	*Carissa spinarum* L.	Apocynaceae	Garna	
5.	*Celtis australis L.*	Cannabaceae	-	
6.	*Cissampelos pareira* L.	Menispermaceae	Batindu	
7.	*Dalbergia sissoo* DC.	Fabaceae	Sheesham	
8.	*Justicia adhatoda* L.	Acanthaceae	Bansuti	
9.	*Mallotus philippensis* (Lam.) Müll.Arg.	Euphorbiaceae	Kaamal	
10.	*Mangifera indica* L.	Anacardiaceae	Aam	
11.	*Murraya koenigii* (L.) Spreng	Rutaceae	Kari patta	+
12.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
13.	*Pinus roxburghii* Sargent	Pinaceae	Pine	
14.	*Prunus amygdalus* Batsch	Rosaceae	Badam	
15.	*Tagetes minuta*L.	Asteraceae	JangaliGenda	+
16.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
17.	*Terminalia chebula* Retz.	Combretaceae	Harad	
18.	*Tinospora cordifolia* (Willd.) Miers	Menispermaceae	Giloya	
19.	*Vitex negundo* L.	Lamiaceae	Nirgundi	+
20.	*Woodfordia fruiticosa* L. Kurz	Lythraceae	Ghaatki	
21.	*Zanthoxylum armatum* DC.	Rutaceae	Tirmir	

Medicinal and aromatic plant species suitable for cultivation in under field conditions

Sl. N.	Name of Species	Family	Common Name	Aromatic
1.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
2.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
3.	*Terminalia chebula* Retz.	Combretaceae	Harad	
4.	*Asparagus adscendens* Roxb.	Asparagaceae	Satavari	
5.	*Tagetes minuta* L.	Asteraceae	Wild marigold	+
6.	*Curcuma sp.*	Zingiberaceae	Haldi	+

Medicinal and aromatic plant species suitable for cultivation under field conditions

Sl. N.	Name of Species	Family	Common Name	Aromatic
1	*Tagetes minuta* L.	Asteraceae	Wild marigold	+
2	*Rosa damascena* Mill.	Rosaceae	Damask rose	+
3	*Ocimum spp.*	Lamiaceae	Tulsi	+
4	*Matricaria chamomilla L.*	Asteraceae	Chamomile	+
5	*Cymbopogon flexuosus* (Nees ex Steud). W. Watson	Poaceae	Lemongrass	+

Interaction with villagers

Interaction with forest officials

GLIMPSE OF FIELD AND FIELD ACTIVITIES

14.Range Mandi; VFDS Dharwahan (Bala Sundri)

Cluster:	Mandi	**Range:**	Mandi
VFDS:	Dharwahan (BalaSundri)	**Panchayat:**	Behal
GPS coordinates:	31°38′21.56″N,76°54′30.98″E	**Altitude:**	950 m

Behal village is situated at an altitude of 950 m amsl. The village is located about 25 km from Mandi. It has about 100 households having 350 populations. The main occupation of people is agriculture. The soil of area is mid hill laom to clay loam with gravel. Climate of the area is hot during summer and cold in winter. The topography of the area is sloppy so agriculture is entirely rainfed. The main agriculture crops grown in the area are wheat, maize, pulses (horse gram, black gram) and vegetables. The detail of medicinal and aromatic plants found in the village and the list of suitable plants/crops for cultivation in forest area and at farmers' field are given in the Tables below.

List of medicinal and aromatic plants found in Dharwahan (Bala Sundri) VFDS

Sl. N.	Name of Species	Family	Common Name	Aromatic
1.	*Asparagus adscendens* Roxb.	Asparagaceae	Satavari	
2.	*Bauhinia variegata* L.	Fabaceae	Kachnar	
3.	*Berberis lycium*Royle	Berberidaceae	Daruharidra, Kashmal	
4.	*Bombax ceiba* L.	Malvaceae	Simbal	
5.	*Cordia myxa* L.	Boraginaceae	Lasuda	
6.	*Dioscorea bulbifera* L.	Dioscoreaceae	Tardi	
7.	*Dioscorea deltoidea* A.Cunn. Ex G. Don	Dioscoreaceae	Singli-Mingli	
8.	*Ficus auriculata* Lour.	Moraceae	Fagoora	
9.	*Ficus palmata* Roxb.	Moraceae	-	
10.	*Ficus religiosa* L.	Moraceae	Pipal	
11.	*Mallotus philippensis* (Lam.) Mull.Arg.	Euphorbiaceae	Kaamal	
12.	*Murraya koenigii* (L.) Spreng	Rutaceae	Kari patta	+
13.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
14.	*Pinus roxburghii* Sargent	Pinaceae	Pine	
15.	*Pistacia integerrima* J. L. Stewart ex Brandis) Rech. f.	Anacardiaceae	Kakdesingha	
16.	*Prunus cerasoides* D. Don	Rosaceae	Padam	
17.	*Pyrus pashia* Buch.-Ham. ex D.Don	Rosaceae	Kaith	
18.	*Syzygium cumini* (L.) Skeels	Myrtaceae	Jamun	
19.	*Toona ciliata* M.Roem.	Meliaceae	Toon	
20.	*Vitex negundo* L.	Lamiaceae	Nirgundi	+
21.	*Woodfordia fruiticosa* L. Kurz	Lythraceae	Ghaatki	
22.	*Ziziphus jujuba* Mill.	Rhamnaceae	Ber	

Medicinal and aromatic plant species suitable for cultivation in under forest conditions

Sl. N.	Name of Species	Family	Common Name	Aromatic
1.	*Asparagus adscendens* Roxb.	Asparagaceae	Satavari	
2.	*Curcuma sp*.	Zingiberaceae	Haldi	+
3.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
4.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
5.	*Terminalia chebula* Retz.	Combretaceae	Harad	

Medicinal and aromatic plant species suitable for cultivation under field conditions

Sl. N.	Name of Species	Family	Common Name	Aromatic
1	*Tagetes minuta* L.	Asteraceae	Wild marigold	+
2	*Ocimum spp.*	Lamiaceae	Tulsi	+
3	*Matricaria chamomilla L.*	Asteraceae	Chamomile	+
4	*Cymbopogon flexuosus* (Nees ex Steud). W. Watson	Poaceae	Lemongrass	+
5	*Withania somnifera* (L.) Dunal	Solanaceae	Ashwagandha	

Interaction with forest officials

Proposed site for conservation of MAPs

GLIMPSE OF FIELD AND FIELD ACTIVITIES

15.Range: Urla; VFDS: Gawali

Cluster:	Mandi	**Range:**	Urla
VFDS:	Gawali	**Panchayat:**	Gawali
GPS coordinates:	31°54′24.44″N,76°54′12.80″E	**Altitude:**	1509 m

Gwali village is situated at an altitude of 1509 m amsl. The village is located about 2 km from Pathankot- Mandi NH154. It has about 40 households having 250 populations. The main occupation of people is agriculture. The soil of area is sandy loam. Climate of the area is hot during summer and cold in winter. The topography of the area is sloppy so agriculture is entirely rainfed. The main agriculture crops grown in the area are wheat, maize, kodra (*Elusine sp*.), pulses (horse gram, black gram) and vegetables. The detail of medicinal and aromatic plants found in the village and the list of suitable plants/crops for cultivation in forest area and at farmers' field are given in the Tables below.

List of medicinal and aromatic plants found in Gawali VFDS

Sl. N.	Name of Species	Family	Common name	Aromatic
1.	*Acorus calamus* L.	Acoraceae	Vach	
2.	*Bauhinia vahlii* Wight &Arn.	Fabaceae	Tor	
3.	*Bauhinia variegata* L.	Fabaceae	Kachnar	
4.	*Berberis lycium*Royle	Berberidaceae	Daruharidra	
5.	*Cissampelos pareira* L.	Menispermaceae	Bhanindu	
6.	*Clematis gouriana* Roxb. ex DC.	Ranunculaceae	-	
7.	*Grewia optiva* J.R.Drumm. ex Burret	Malvaceae	Ghaman	
8.	*Juglans regia* L.	Juglandaceae	Akhrot	
9.	*Phoenix sylvestris* (L.) Roxb.	Arecaceae	Khajur	
10.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
11.	*Pinus roxburghii* Sargent	Pinaceae	Pine	
12.	*Prins epiautilis* Royle	Rosaceae	Bhekhal	
13.	*Prunus cerasoides* D. Don	Rosaceae	Padam	
14.	*Punica granatum* L.	Lythraceae	Dadim	
15.	*Ricinus communis* L.	Euphorbiaceae	Arand	
16.	*Rubus ellipticus* Sm.	Rosaceae		
17.	*Tagetes minuta* L.	Asteraceae	JangaliGenda	+
18.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
19.	*Terminalia chebula* Retz.	Combretaceae	Harad	
20.	*Urtica dioica* L.	Urticaceae	Bicchubooti	
21.	*Zanthoxylum armatum* DC.	Rutaceae	Tirmir	+
22.	*Ziziphus jujuba* Mill.	Rhamnaceae	Ber	

Medicinal and aromatic plant species suitable for cultivation in forest area

Sl. N.	Proposed MAPs Species	Family	Common Name	Aromatic
1.	*Valeriana jatamansi*	Valerianaceae	Mushkbala	+
2.	*Hedychium spicatum* Buch. Ham. ex Smith.	Zingiberaceae	Kapoor Kachari	+
3.	*Viola odorata*	Violaceae	Banafsa	
4.	*Curcuma aromatica*	Zingiberaceae	Jangli haldi	+

Medicinal and aromatic plant species suitable for cultivation in under field conditions

Sl. N.	Name of Species	Family	Common Name	Aromatic
1	*Tagetes minuta* L.	Asteraceae	Wild marigold	+
2	*Rosa damascena* Mill.	Rosaceae	Damask Rose	+
3	*Rosmarinus officinalis*	Lamiaceae	Rosemary	+
4	*Matricaria chamomilla* L.	Asteraceae	Chamomile	+
5	*Ocimum spp.*	Lamiaceae	Tulsi	+

Interaction with forest officials

Interaction with forest officials and villagers

GLIMPSE OF FIELD AND FIELD ACTIVITIES

16.Range: Urla; VFDS: Thorat

Cluster:	Mandi	**Range:**	Urla
VFDS:	Thorat	**Panchayat:**	Kandhar
GPS coordinates:	31°56′30.88″N,76°50′55.11″E	**Altitude:**	1280 m

Thorat is situated at an altitude of 1280 m amsl. The village is located about 10 km from Pathankot- Mandi NH154. It has about 30 households having 150 populations. The village is not connected by road so one has to track about 2 km from road. The main occupation of people is agriculture. The soil of area is sandy loam. Climate of the area is hot during summer and cold in winter. The topography of the area is sloppy so agriculture is entirely rainfed. The main agriculture crops grown in the area are wheat, maize, kodra (*Elusine sp*.), pulses (horse gram, black gram) and vegetables. The detail of medicinal and aromatic plants found in the village and the list of suitable plants/crops for cultivation in forest area and at farmers' field are given in the Tables below.

List of medicinal and aromatic plants found in Thorat VFDS

Sl. N.	Name of Species	Family	Common Name	Aromatic
1.	*Bauhinia variegata* L.	Fabaceae	Kachnar	
2.	*Bombax ceiba* L.	Malvaceae	Simbal	
3.	*Murraya koenigii* (L.) Spreng	Rutaceae	Kari patta	+
4.	*Myrica esculenta* Buch.-Ham. ex D. Don	Myricaceae	Kafal	
5.	*Pinus roxburghii* Sargent	Pinaceae	Pine	
6.	*Prunus cerasoides* D. Don	Rosaceae	Padam	
7.	*Punica granatum* L.	Lythraceae	Dadim	
8.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
9.	*Tinospora cordifolia* (Willd.) Miers	Menispermaceae	Giloya	
10.	*Viola pilosa* Blume	Violaceae	Bnafasha	
11.	*Vitex negundo* L.	Lamiaceae	Nirgundi	+
12.	*Asparagus adscendens* Roxb.	Asparagaceae	Satavari	
13.	*Berberis lycium* Royle	Berberidaceae	Daruharidra, Kashmal	
14.	*Dioscorea bulbifera* L.	Dioscoreaceae	Tardi	
15.	*Lyonia oblongifolia*			
16.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
17.	*Prinsepia utilis* Royle	Rosaceae	Bhekhal	
18.	*Toona ciliata* M.Roem.	Meliaceae	Toon	
19.	*Woodfordia fruiticosa* Kurz	Lythraceae	Ghaatki	

Medicinal and aromatic plant species suitable for cultivation in forest area

Sl. N.	Proposed MAPs Species	Family	Common Name	Aromatic
1.	*Tagetes minuta* L.	Asteraceae	Wild marigold	+
2.	*Valeriana jatamansi*	Valerianaceae	Mushkbala	+
3.	*Hedychium spicatum* Buch. Ham. ex Smith.	Zingiberaceae	Kapoor Kachari	+
4.	*Viola odorata*	Violaceae	Bnafsa	
5.	*Curcuma aromatica*	Zingiberaceae	Jangli haldi	+

Medicinal and aromatic plant species suitable for cultivation in under field conditions

Sl. N.	Name of Species	Family	Common Name	Aromatic
1	*Tagetes minuta* L.	Asteraceae	Wild marigold	+
2	*Rosa damascena* Mill.	Rosaceae	Damask Rose	+
3	*Ocimum spp.*	Lamiaceae	Tulsi	+
4	*Matricaria chamomilla* L.	Asteraceae	Chamomile	+

Interaction with forest officials and villagers

Proposed site for conservation of MAPs

GLIMPSE OF FIELD AND FIELD ACTIVITIES

17. Range: Jogindernagar; VFDS: Banehar

Cluster:	Mandi	**Range:**	Jogindernagar
VFDS:	Banehar	**Panchayat:**	RopaPadhar
GPS coordinates:	31°95′11.01″N,76°82′27.39″E	**Altitude:**	1310 - 1400 m

Ropa Padhar village is located in Jogindernagar Tehsil of Mandi district in Himachal Pradesh, India. It is situated 49km away from district headquarter. Jogindernagar is the sub-district headquarter of Ropa Padhar village. The village is located about 8 km from Pathankot- Mandi NH154. It has about 125 households having 350 populations. The village is not yet connected by road and road construction is in process. The main occupation of people is agriculture. The soil of area is clayey loam. Climate of the area is hot during summer and cold in winter. The topography of the area is sloppy so agriculture is mainly rainfed. The main agriculture crops grown in the area are wheat, maize, kodra (*Elusine sp*.), pulses (horse gram, black gram, and rajmah) and vegetables. The detail of medicinal and aromatic plants found in the village and the list of suitable plants/crops for cultivation in forest area and at farmers' field are given in the Tables below.

List of medicinal and aromatic plants found in Ropa Padhar

Sl. N.	Name of Species	Family	Common Name	Aromatic
1.	*Bauhinia variegata* L.	Fabaceae	Kachnar	
2.	*Bombax ceiba* L.	Malvaceae	Simbal	
3.	*Murraya koenigii* (L.) Spreng	Rutaceae	Kari patta	+
4.	*Myrica esculenta* Buch.-Ham. ex D. Don	Myricaceae	Kafal	
5.	*Pinus roxburghii* Sargent	Pinaceae	Pine	
6.	*Prunus cerasoides* D. Don	Rosaceae	Padam	
7.	*Punica granatum* L.	Lythraceae	Dadim	
8.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
9.	*Tinospora cordifolia* (Willd.) Miers	Menispermaceae	Giloya	
10	*Viola pilosa* Blume	Violaceae	Vanafasha	
11	*Vitex negundo* L.	Lamiaceae	Nirgundi	+
12	*Asparagus adscendens* Roxb.	Asparagaceae	Satavari	
13	*Berberis lyceum* Royle	Berberidaceae	Daruharidra, Kashmal	
14	*Dioscorea bulbifera* L.	Dioscoreaceae	Tardi	
15	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
16	*Prinsepia utilis* Royle	Rosaceae	Bhekhal	
17	*Toona ciliata* M. Roem.	Meliaceae	Toon	
18	*Woodfordia fruiticosa* Kurz	Lythraceae	Ghaatki	

Medicinal and aromatic plant species suitable for cultivation in forest area

Sl. N.	Proposed MAPs Species	Family	Common Name	Aromatic
1.	*Valeriana jatamansi*	Valerianaceae	Mushkbala	+
2.	*Hedychium spicatum* Buch. Ham. ex Smith.	Zingiberaceae	Kapoor Kachari	+
3.	*Tagetes minuta* L.	Asteraceae	Wild marigold	+
4.	*Viola odorata*	Violaceae	Banafsa	
5.	*Curcuma aromatica*	Zingiberaceae	Jangli haldi	+

Medicinal and aromatic plant species suitable for cultivation in under field conditions

Sl. N.	Name of Species	Family	Common Name	Aromatic
1	*Tagetes minuta* L.	Asteraceae	Wild marigold	+
2	*Rosa damascena* Mill.	Rosaceae	Damask Rose	+
3	*Valeriana jatamansi*	Valerianaceae	Mushkbala	+
4	*Rosmarinus officinalis*	Lamiceae	Rosemary	+
5	*Lavandula hybrid* Rev.	Lamiaceae	Lavandin	+

Proposed site for conservation of MAPs

18.Range: Joginder Nagar; VFDS: Panchjan

Cluster:	Mandi	**Range:**	Joginder Nagar
VFDS:	Panchjan	**Panchayat:**	Zimzima
GPS coordinates:	32°00′25.25″N, 76°48′26.20″E	**Altitude:**	1798 m

Panchjan village is situated at an altitude of 1798 m amsl. The village is located about 7 km from Joginder nagar. It has about 60 households having 400 populations. The main occupation of people is agriculture. The soil of area is sandy loam. Climate of the area is hot during summer and cold in winter. The topography of the area is sloppy so agriculture is entirely rainfed. The main agriculture crops grown in the area are wheat, maize, kodra (*Elusine sp*.), pulses (horse gram, black gram) and vegetables. The detail of medicinal and aromatic plants found in the village and the list of suitable plants/crops for cultivation in forest area and at farmers' field are given in the Tables below.

List of medicinal and aromatic plants found in Panchajan VFDS

Sl. N.	Name of Species	Family	Common Name	Aromatic
1.	*Albizia chinensis* (Osbeck) Merr.	Fabaceae	Sirish	
2.	*Bauhinia variegata* L.	Fabaceae	Kachnar	
3.	*Bombax ceiba* L.	Malvaceae	Simbal	
4.	*Cassia fistula* L.	Fabaceae	Amaltas	
5.	*Grewia optiva* J.R. Drumm. ex Burret	Malvaceae	Ghaman	
6.	*Murraya koenigii* (L.) Spreng	Rutaceae	Kari patta	+
7.	*Myrica esculenta* Buch.-Ham. ex D. Don	Myricaceae	Kafal	
8.	*Pinus roxburghii* Sargent	Pinaceae	Pine	
9.	*Pistacia integerrima* J. L. Stewart ex Brandis	Anacardiaceae	Kakrasinghi	
10.	*Prunus cerasoides* D. Don	Rosaceae	Padam	
11.	*Punica granatum* L.	Lythraceae	Dadim	
12.	*Sapindus mukorossi* Gaertn.	Sapindaceae	Ritha	
13.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
14.	*Terminalia chebula* Retz.	Combretaceae	harad	
15.	*Tinospora cordifolia* (Willd.) Miers	Menispermaceae	Giloya	
16.	*Viola pilosa* Blume	Violaceae	Vanfasha	
17.	*Vitex negundo* L.	Lamiaceae	Nirgundi	+
18.	*Zanthoxylum armatum* DC.	Rutaceae	Tirmir	+
19.	*Rhododendron arboreum* Sm.	Ericaceae	Burans	
20.	*Cedrus deodara* (Roxb. ex D.Don) G.Don	Pinaceae	Devdaru	
21.	*Morus alba* L.	Moraceae	Shahtut	
22.	*Valeriana jatamansi* Jones	Caprifoliaceae	Jatamansi	
23.	*Bergenia ciliata* (Haw.) Sternb.	Saxiferagaceae	Pashanbhed	

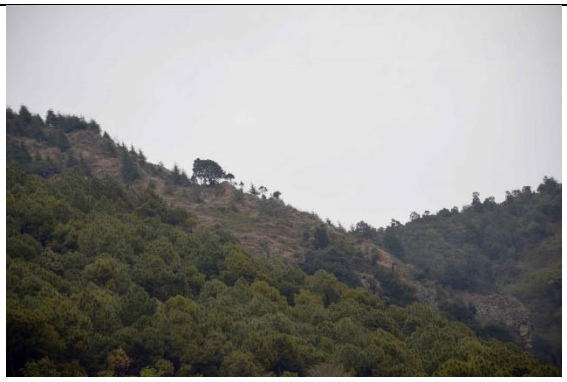
Medicinal and aromatic plant species suitable for cultivation in forest area

Sl. N.	Proposed MAPs Species	Family	Common Name	Aromatic
1.	*Valeriana jatamansi*	Valerianaceae	Mushkbala	+
2.	*Tagetes minuta* L.	Asteraceae	Wild marigold	+
3.	*Hedychium spicatum* Buch. Ham. ex Smith.	Zingiberaceae	Kapoor Kachari	+
4.	*Viola odorata*	Violaceae	Banafsa	
5.	*Curcuma aromatica*	Zingiberaceae	Jangli haldi	+

Medicinal and aromatic plant species suitable for cultivation in under field conditions

Sl. N.	Name of Species	Family	Common Name	Aromatic
1	*Tagetes minuta* L.	Asteraceae	Wild marigold	+
2	*Rosa damascena* Mill.	Rosaceae	Damask Rose	+
3	*Valeriana jatamansi*	Valerianaceae	Mushkbala	+
4	*Rosmarinus officinalis*	Lamiceae	Rosemary	+
5	*Lavandula hybrid* Rev.	Lamiaceae	Lavandin	+

Interaction with forest officials and villagers



Proposed site for conservation of MAPs

GLIMPSE OF FIELD AND FIELD ACTIVITIES

19.Range:Kotli; VFDS: Kot

Cluster:	Mandi	**Range:**	Kotli
VFDS:	Kot	**Panchayat:**	Drubal Mandohar
GPS coordinates:	31°48′18.25″N, 76°51′07.08″E	**Altitude:**	898 m -1130 m

Kotli Tungal (Kotli) is a small town in Himachal Pradesh, in northern India. It is 35 km from the town of Mandi, Kotli is a Sub District (tehsil) of Mandi District. Kotli and the surrounding area are also known as Tungal valley. The area is dominated with pine forests. The soil is sandy loam. Most of the villagers fall under well off class and low income group. Main sources of income are Govt. job, Pvt. Job, agriculture and other small works. The main cropping system is maize- wheat. The farmers grow only traditional crops *viz.*, maize, wheat, paddy, barly, sarson etc. and non of them is engaged in cultivation of medicinal and aromatic plants. The area is almost rainfed. There is menace of animals, monkey, wild boar. The soil of the farmer field is fertile, sandy loam. Maximum and minimum temperature ranges between 4 to 42 °C during winter and summer, respectively. The village is on west facing side. The detail of medicinal and aromatic plants found in the village and the list of suitable plants/crops for cultivation in forest area and at farmers' field are given in the Tables below.

List of medicinal and aromatic plants found in Kot VFDS

Sl. N.	Name of Species	Family	Common Name	Aromatic
1.	*Albizia chinensis* (Osbeck) Merr.	Fabaceae	Sirish	
2.	*Asparagus adscendens* Roxb.	Asparagaceae	Satavari	
3.	*Bauhinia vahlii* Wight & Arn.	Fabaceae	Tor	
4.	*Bauhinia variegata* L.	Fabaceae	Kachnar	
5.	*Berberis lycium* Royle	Berberidaceae	Daruharidra, Kashmal	
6.	*Bombax ceiba* L.	Malvaceae	Simbal	
7.	*Butea monosperma* (Lam.) Taub.	Fabaceae	Palash	
8.	*Carissa spinarum* L.	Apocynaceae	garna	
9.	*Cassia fistula* L.	Fabaceae	Amaltas	
10.	*Cinnamomum tamala* (Buch.-Ham.) T.Nees & Eberm.	Lauraceae	Tejpatta	+
11.	*Cordia myxa* L.	Boraginaceae	Lasuda	
12.	*Datura stramonium* L.	Solanaceae	Dhatura	
13.	*Dioscorea bulbifera* L.	Dioscoreaceae	Tardi	
14.	*Ficus auriculata* Lour.	Moraceae	Fagoora	
15.	*Ficus religiosa* L.	Moraceae	Pipal	
16.	*Grewia optiva* J.R. Drumm. ex Burret	Malvaceae	Ghaman	
17.	*Justicia adhatoda* L.	Acanthaceae	Bansuti	
18.	*Mallotus philippensis* (Lam.) Mull. Arg.	Euphorbiaceae	Kaamal	
19.	*Mangifera indica* L.	Anacardiaceae	Aam	

20.	*Murraya koenigii* (L.) Spreng	Rutaceae	Kari patta	+
21.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
22.	*Pinus roxburghii* Sargent	Pinaceae	Pine	
23.	*Plantago major* L.	Plantaginaceae	Jangali Isabgol	
24.	*Prunus cerasoides* D.Don	Rosaceae	Padam	
25.	*Rosa brunonii* Lindl.	Rosaceae	Jangali Gulab	+
26.	*Tagetes minuta* L.	Asteraceae	Jangali Genda	+
27.	*Terminalia chebula* Retz.	Combretaceae	Harad	
28.	*Thalictrum foliolosum* DC.	Ranunculaceae	Mamiri	
29.	*Tinospora cordifolia* (Willd.) Miers	Menispermaceae	Giloya	
30.	*Toona ciliata* M.Roem.	Meliaceae	Toon	
31.	*Viola pilosa* Blume	Violaceae	Vanafasa	
32.	*Vitex negundo* L.	Lamiaceae	Nirgundi	+
33.	*Woodfordia fruiticosa* L. Kurz	Lythraceae	Ghaatki	
34.	*Zanthoxylum armatum* DC.	Rutaceae	Tirmir	+
35.	*Ziziphus jujuba* Mill.	Rhamnaceae	Ber	

Medicinal and aromatic plant species suitable for cultivation in forest area

Sl. N.	Proposed MAPs Species	Family	Common Name	Aromatic
1.	*Cinnamomum tamala* (Buch.-Ham.) T. Nees & Eberm.	Lauraceae	Tejpatta	+
2.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
3.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
4.	*Terminalia chebula* Retz.	Combretaceae	Harad	
5.	*Curcuma aromatica*	Zingiberaceae	Jangli haldi	+

Medicinal and aromatic plant species suitable for cultivation in field conditions

Sl. N.	Proposed MAPs Species	Family	Common Name	Aromatic
1.	*Tagetes minuta* L.	Asteraceae	Wild marigold	+
2.	*Ocimum spp.*	Lamiaceae	Tulsi	+
3.	*Rosmarinus officinalis* L.	Lamiaceae	Rosemary	+
4.	*Matricaria chamomilla* L.	Asteraceae	Chamomile	+

GLIMPSE OF FIELD AND FIELD ACTIVITIES

1. Interaction with forest officials

2. Interaction with JICA committee members and villagers

3. Proposed site for conservation of MAPs

20.Range: Kotli; VFDS: Lagdhar-1

Cluster:	Mandi	**Range:**	Kotli
VFDS:	Lagdhar-1	**Panchayat:**	Lagdhar
GPS coordinates:	31°47′02.67″N,76°49′52.46″E	**Altitude:**	1393 -1500 m

Lagdhar village is located in Kotli Tehsil of Mandi district in Himachal Pradesh, India. It is situated 35 km away from district headquarter Kotli. Kotli is the sub-district headquarter of Lagdhar village. The total geographical area of village is 121.19 hectares. Lagdhar has a total population of 446 peoples. There are about 101 houses in Lagdhar village. Mandi is nearest town to Lagdhar. The main cropping system is maize- wheat. The farmers grow only traditional crops *viz.*, maize, wheat, paddy, barly, sarson etc. and non of them is engaged in cultivation of medicinal and aromatic plants. The area is almost rainfed. There is menace of animals *viz.*, monkey, wild boar. The village is on North facing side. The detail of medicinal and aromatic plants found in the village and the list of suitable plants/crops for cultivation in forest area and at farmers' field are given in the Tables below.

List of medicinal and aromatic plants found in Laghdhar village

Sl. N.	Name of Species	Family	Common Name	Aromatic
1.	*Achyranthes bidentata* Blume	Amaranthaceae	Amamarg	
2.	*Albizia chinensis* (Osbeck) Merr.	Fabaceae	Sirish	
3.	*Asparagus adscendens* Roxb.	Asparagaceae	Satavari	
4.	*Bauhinia vahlii* Wight & Arn.	Fabaceae	Tor	
5.	*Bauhinia variegata* L.	Fabaceae	Kachnar	
6.	*Berberis lycium* Royle	Berberidaceae	Daruharidra, Kashmal	
7.	*Bombax ceiba* L.	Malvaceae	Simbal	
8.	*Carissa spinarum* L.	Apocynaceae	Garna	
9.	*Cedrus deodara* (Roxb. ex D.Don) G.Don	Pinaceae	Devdaru	
10.	*Cinnamomum tamala* (Buch.-Ham.) T.Nees & Eberm.	Lauraceae	Tejpatta	+
11.	*Cissampelos pareira* L.	Menispermaceae	Bhanindu	
12.	*Dioscorea bulbifera* L.	Dioscoreaceae	Tardi	
13.	*Mallotus philippensis* (Lam.) Müll.Arg.	Euphorbiaceae	Kaamal	
14.	*Murraya koenigii* (L.) Spreng	Rutaceae	Kari patta	+
15.	*Phyllanthus emblica* L.	Phyllanthaceae	Amla	
16.	*Pinus roxburghii* Sargent	Pinaceae	Pine	
17.	*Pistacia integerrima* J. L. Stewart ex Brandis	Anacardiaceae	Kakra singhi	
18.	*Prunus cerasoides* D. Don	Rosaceae	Padam	
19.	*Punica granatum* L.	Lythraceae	Dadim	
20.	*Rhododendron arboreum* Sm.	Ericaceae	Burans	
21.	*Rubia cordifolia* L.	Rubiaceae	Manjistha	
22.	*Rubus ellipticus* Sm.	Rosaceae	Aakhe	
23.	*Solanum khasianum* C.B. Clarke	Solanaceae	Vrahat Kantkari	

24.	*Syzygium cumini* (L.) Skeels	Myrtaceae	Jamun	
25.	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Baheda	
26.	*Terminalia chebula* Retz.	Combretaceae	Harad	
27.	*Viola pilosa* Blume	Violaceae	Vanfasha	
28.	*Vitex negundo* L.	Lamiaceae	Nirgundi	+
29.	*Woodfordia fruiticosa* L. Kurz	Lythraceae	Ghaatki	
30.	*Zanthoxylum armatum* DC.	Rutaceae	Tirmir	+

Medicinal and aromatic plant species suitable for cultivation in forest area

Sl. N.	Proposed MAPs Species	Family	Common Name	Aromatic
1.	*Valeriana jatamansi* Jones.	Valerianaceae	Mushkbala	+
2.	*Curcuma aromatic* Salisb.	Zingiberaceae	Jangali Haldi	+
3.	*Hedychium spicatum* Buch. Ham. ex Smith.	Zingiberaceae	Kapoor Kachari	+
4.	*Punica granatum* L.	Lythraceae	Dadim	
5.	*Cinnamomum tamala* (Buch.-Ham.) T. Nees & Eberm.	Lauraceae	Tejpatta	+

Medicinal and aromatic plant species suitable for cultivation in farmers' field conditions

Sl. N.	Proposed MAPs Species	Family	Common Name	Aromatic
1.	*Tagetes minuta* L.	Asteraceae	Wild marigold	+
2.	*Rosmarinus officinalis*	Lamiaceae	Rosemary	+
3.	*Valeriana jatamansi* Jones.	Valerianaceae	Mushkbala	+
4.	*Matricaria chamomilla* L.	Asteraceae	Chamomile	+
5.	*Rosa damascena* Mill.	Rosaceae	Damask rose	+
6.	*Pelargonium graveolens* L.	Geraniaceae	Rose geranium	+

GLIMPSE OF FIELD AND FIELD ACTIVITIES

	
Interaction with forest officials, JICA committee members and villagers	Proposed site for conservation of MAPs

Objective: Identify the issues in conservation, regeneration, harvesting and management of Medicinal & Aromatic Plants in the cluster, and

Minimum Support Price (MSP) for Cultivated MAPs

Cultivation of medicinal plants has not taken off in the State, as the raw material sourced from the wild is available at cheaper rates even as it has deleterious effect on their wild populations. To make cultivation lucrative, it is necessary to support the cultivation effort - both technically and financially. There is a need to support cultivation of more and more species critical to the sector while ensuring quality. Minimum Support Price for the medicinal plants is important for preventing exploitation of farmers at the hands of traders and other middlemen. The Forest department should constitute a Committee on price fixing of cultivated produce. The minimum support price should be fixed at the State level after consultation with farmers group, scientists and other concerned organisations, institutions as well as industries. This will give a boost to cultivation in state. Farmers would know the price and can plan large scale cultivation in advance. In each cluster minimum of 5 ha area should be brought under particular crop. So that there is sufficient raw material for processing and value addition.

For development of sector it is necessary that:

- Farmers should be provided good quality planting material of high yielding varieties.
- Medicinal plants should be harvested at proper stage and their storage should be proper. Drying of the medicinal plants should be at proper temperature. Solar drier should be used to maintain the quality of produce.
- The quality of produce can be checked at recognized laboratory for getting remunerative price at national or international market.

Organic Cultivation and promotion of Mix-cropping of Medicinal Plants:

The herbal drug industry world over prefers herbal raw material produced through organic farming. The herbal raw material produced through organic farming fetches high value in the market. Organic farming should be promoted amongst the farmers of medicinal plants. Though most of the cluster are by default organic but procurement of organic certificate to the produce will add value to the produce.

Strengthening Infrastructure for processing

It is estimated that as high as 30% of the raw material reaching the manufacturers is of poor quality and is, therefore, rejected. Cultivation and collection of medicinal plants, therefore, needs to be supported with infrastructure for warehousing, drying, grading, storage and transportation. These facilities are essential for increasing the marketability of the medicinal plants, adding value to the produce increasing profitability and reducing losses. There is a need to support infrastructure for processing and post-harvest management in the identified clusters/zones in the Mandi district. A processing unit of 4-5 q capacity is to be installed at central location of the village which can cater to the need of 8-10 ha of area under particular aromatic crop.

Clusters for Cultivation and Financial Support for farmers

Clusters based on the agro-climatic conditions. One species for one cluster should be motto to get volume of raw material for trade as herbal industry needs bulk quantity. Cluster based farming will reduce the cost of cultivation and make it easy to manage the farm economically. All infrastructures can be made available for post-harvest management in these identified clusters. Wherever possible these vacant lands should be utilised properly and existing financial support can be availed from concern departments.

Farmers need financial support for cultivation of medicinal plants in initial stages to procure the seeds and for preparation of field as per protocol. MAPs cultivation is a comparatively new field so farmers need continuous support in terms of financial and technical. Apart from this, there is a need to provide the marketing support for cultivated produce.

Objective: Prepare a plan for conservation, resource development and sustainable management of Medicinal & Aromatic Plants in the cluster.

Measures are necessary to conserve medicinal plants that are growing in wide variety of habitats in the forests. Conservation of genetic diversity of any species is possible through maintaining its viable breeding population in the wild. A way to conserve species is to let it follow its natural evolutionary course and afford protection to it in the wild. Medicinal plants species exist mainly in forests and hence it is necessary to promote *in-situ* conservation. A network of natural sites or forests representing the diversity of forest type needs to be established for *in-situ* conservation of medicinal plants.

Package of practices of Recommended crops.

Wild marigold (*Tagetes minuta* L.*)*

Family	Asteraceae
Common name	Jangligaindha
Major components	(Z)-β-ocimene, dihydro-tagetone, (Z)- and (E)-tagetones
Altitudes	1000 to 2500 m amsl
Suitable region	Sub tropical and temperate region
Uses	Essential oil is used in perfumery, flavour and for the synthesis of aroma chemicals.
Propagation	Seed sowing and transplanting
Plant spacing	45 X 45 cm (transplanting) 60 cm (line sowing)
Seed rate	3 kg/ha (seed sowing) 1 kg/ha (for raising nursery)
Plantation time	May-June
Manure	FYM 25 t/ha
Harvesting	October-November
Biomass yield (t/ha)	12-15
Average oil content (%)	0.30 (±0.05)
Essential oil yield (kg/ha)	36-45

Damask rose (*Rosa damascena* Mill.)

Family	Rosaceae
Common name	Damask rose
Major components	Citronellol, geraniol, phenyl ethyl alcohol
Altitudes	200 to 2500 m amsl
Suitable region	Tropical and temperate region
Uses	It is used in flavouring, perfumery, cosmetic, aromatic and pharmaceutical industries.
Propagation	Rooted plants/ cuttings
Plant spacing	1.5 m X 1.0 m
Plant population	7,000 rooted plants/ha
Plantation time	July –August and December-January
Manure	FYM 30 t/ha
Harvesting	April-May (third year onwards)
Flower yield (t/ha)	2.5-3.0
Average oil content (%)	0.025- 0.030
Essential oil yield (kg/ha)	0.625-0.750

Muskbala (*Valeriana jatamansi*)

Family	Valerianaceae
Common name	Muskbala
Major components	Patchouli alcohol
Altitudes	1200 m to 3500 m amsl
Suitable region	Sub tropical and temperate region
Uses	It is used as sedative and tranquilizers in ayurvedic system of medicines.
Propagation	Seed sowing or using portions of the root-stock
Plant spacing	40 X 30 cm
Plant population	85,000 plants/ha
Plantation time	Seed sowing: March-April Transplanting: July-September
Manure	FYM 45 t/ha
Harvesting	November –December (After second year)
Root yield (t/ha)	1.0
Average oil content (%)	0.4 - 0.5
Essential oil yield (kg/ha)	15

Rosemary (*Rosmarinus officinalis*)

Family	Lamiaceae
Common name	Rosemary
Major components	α-pinene, β-pinene, camphene
Altitudes	1200 to 2500 m amsl
Suitable region	Sub tropical and temperate region
Uses	It is used in aroma, food, beverage and cosmetic industries.
Propagation	Stem cuttings and seeds
Plant spacing	60 X 60 cm
Plant population	28,000 rooted plants/ha
Plantation time	September-October
Manure	FYM 25 t/ha
Harvesting	July-August (second year onwards 2-3 cuts)
Biomass yield (t/ha)	10 -12
Average oil content (%)	0.8-1.0
Essential oil yield (kg/ha)	80-120

Lemongrass (*Cymbopogon flexuosus*)

Family	Poaceae
Common name	Lemon grass
Major component	Citral
Altitudes	500 to 900 m amsl
Suitable region	Tropical and subtropical region
Uses	Used in perfumery, flavor and fragrance industry.
Propagation	Rooted slips
Plant spacing	50 X 50 cm
Plant population	40,000 slips/ha
Plantation time	February-March (Irrigated) June-July (Un-irrigated)
Manure	FYM 15-20 t/ha
Harvesting	3-4 times in year
Fresh biomass yield (t/ha)	20- 25 (From 3-4 harvests/year)
Average oil content (%)	0.5
Essential oil yield (kg/ha)	100-125

Rose geranium (*Pelargonium graveolens*)

Family	Geraniaceae
Common name	Rose geranium
Major components	Citronellol, geraniol, linalool
Altitudes	500 to 2400 m amsl
Suitable region	Sub tropical and temperate region
Uses	Essential oil is used in aroma and pharmaceutical industry.
Propagation	Stem cuttings
Plant spacing	45 X 45 cm
Plant population	50,000 plants/ha
Plantation time	February to March
Manure	FYM 25-30 t/ha
Harvesting	May-June (2-3 cuts/year)
Biomass yield (t/ha)	20-25
Average oil content (%)	0.15 - 0.20
Essential oil yield (kg/ha)	25-30

Lavandin (*Lavandula hybrida*)

Family	Lamiaceae
Common name	Lavandin
Major components	Linalool and linalyl acetate
Altitudes	1200 to 2000 m amsl
Suitable region	Sub tropical and sub temperate region
Uses	It is used in pharmaceutical and fragrance industry.
Propagation	Stem cuttings
Plant spacing	75 X 60 cm (low to medium fertile soils) 90 X 60cm (high fertile soils)
Plant population	22,200 rooted plants/ha (low to medium fertile soils) 18,519 rooted plants/ha (high fertile soils)
Plantation time	October to January (low to mid hills) March to April (high hills)
Manure	FYM 25 t/ha
Harvesting	May –August (second year onwards)
Flower yield (t/ha)	8-12
Average oil content (%)	1.0
Essential oil yield (kg/ha)	80-120

Chamomile *(Matricaria chamomilla)*

Family	Asteraceae
Common name	Chamomile
Major components	Bisabolol oxides, α-bisabolol, chamazulene
Altitudes	Upto 1500 m amsl
Suitable region	Tropical, subtropical and sub temperate region
Uses	Used in perfumery, pharmaceutical and aromatherapy industries.
Propagation	Seed sowing and transplanting
Plant spacing	40 cm (direct seed sowing) 45 X 30 cm (transplanting)
Seed rate	1 kg /ha (direct seed sowing) 500-700 g/ha (nursery raising)
Plantation time	September-October (seed sowing) November (transplanting)
Manure	FYM 25 t/ha or Vermicompost 5 t/ha
Harvesting	April-May
Fresh flower yield (t/ha)	5 -7
Dry flower yield (t/ha)	1.0 -1.5
Average oil content (%)	0.8- 1.0
Essential oil yield (kg/ha)	7-8

Palmarosa (*Cymbopogon martinii*)

Family	Poaceae
Common name	Rosa grass, Palmarosa
Major components	Geraniol, geranyl acetate
Altitudes	300 to 1500 m amsl
Suitable region	Tropical and subtropical region
Uses	Essential oil is used in perfumery, flavour and fragrance industry.
Propagation	Rooted slips
Plant spacing	50 X 50 cm
Plant population	40,000 slips/ha
Plantation time	July
Manure	FYM 25 t/ha
Harvesting	February-March September-October
Fresh herb yield (t/ha)	50-60
Average oil content (%)	0.25
Essential oil yield (kg/ha)	120-130 (Irrigated conditions) 75-80 (Rainfed conditions)

Sweet basil (*Ocimum basilicum* L.)

Family	Lamiaceae
Common name	Sweet basil
Major components	Methyl chavicol, linalool, citral
Altitudes	100 to 1600 m amsl
Suitable region	Tropical and sub tropical region
Uses	Essential oil is used in pharmaceutical, perfumery and aroma industries.
Propagation	Seed sowing and transplanting
Plant spacing	45 X 45 cm (low to medium fertile soils) 60 X 45 cm (high fertile soils)
Seed rate/plant population	1 kg/ha (seed sowing) 200-300 g/ha (for nursery raising) 27000 plants/ha
Manure	FYM 25-30 t/ha Or Vermicompost 5 t/ha
Plantation time	June- July
Harvesting	3 months after planting at full bloom stage
Fresh herb yield (t/ha)	15-20
Average oil content (%)	0.5-0.6
Essential oil yield (kg/ha)	75-100

Jangli haldi (*Curcuma aromatica* Salisb.)

Family	Zingiberaceae
Common name	Jangli haldi
Major component	1,8 cineole, iso bournyl
Altitudes	1000 to 2500 m amsl
Suitable region	Sub tropical and temperate region. Suitable for intercropping in between forest plants
Uses	Used in food, cosmetic and pharmaceutical industry.
Propagation	Rhizomes
Plant spacing	50 X 50 cm
Seed rate	15 q rhizomes/ha
Plantation time	December- January
Manure	FYM 30-35 t/ha
Harvesting	After two years
Fresh rhizome yield (t/ha)	60
Average oil content (%)	2.4
Essential oil yield (kg/ha)	150-200

Kapoorkachri (*Hedychium spicatum* Buch. Ham. ex Smith.)

Family	Zingiberaceae
Common name	Spiked ginger lily, Kapoorkachri
Major component	β-pinene, 1,8-cineole, β-eudesmol
Altitudes	1000 to 2800 m amsl
Suitable region	Subtropical and temperate region. Suitable for intercropping in between forest plants
Uses	Used in medicines, food, cosmetics and perfumery i ndustries.
Propagation	Rhizomes
Plant spacing	100 cm X 25 cm
Seed rate	12-13 q rhizomes/ha
Plantation time	December- January
Manure	FYM 30-35 t/ha
Harvesting	After two years
Fresh rhizome yield (t/ha)	12
Average oil content (%)	0.50
Essential oil yield (kg/ha)	60

Ashwagandha(*Withania somnifera)*

Family	Solanaceae
Common name	Ashwagandha
Altitudes	600-1200 m amsl
Suitable region	Tropical and Subtropical region.
Uses	Rejuvenating agent, anti inflammatory, immunomodulatory, anti stress properties.
Propagation	Seeds
Plant spacing	60 x 60 cm
Seed rate	2 kg seed/ha
Plantation time	June-July
Manure	FYM 25-30 t/ha
Harvesting	March- April
Yield Dry root(t/ha)	0.5 t roots and 50-75 kg seeds