STUDY ON CONSERVATION AND CULTIVATION OF MEDICINAL AND AROMATIC PLANT IN PITHORAGARH DISTRICT OF UTTRAKHAND

Dissertation Submitted to

The IIHMR University, Jaipur

For the partial fulfilment for the award of the degree of Master of Business Administration

(MBA)

In Rural Management by

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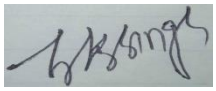
Under the Supervision and Guidance of

Professor Laxman Swaroop Sharma

2021

Declaration by Student

I hereby declare that this dissertation titled Study on conservation and cultivation of medicinal and aromatic plant in Pithorgarh district of Uttrakhand in Pithorgarh region of Uttrakhand is the bonafide record of my unique examination work. I announce that it has not been submitted to some other college or establishment for the honour of any degree or confirmation. Data got from the distributed or unpublished work of other has been appropriately recognized in the content.



Sunil Kumar Singh

01/07/2021

CERTIFICATE

This is to certify that dissertation Study on conservation and cultivation of medical and aromatic plant in Pithorgarh district of Uttrakhand is a record of the exploration work attempted by Sunil Kumar Singh in halfway satisfaction of the necessities for the honor of the degree of MBA Rural Management from the IIHMR University, Jaipur under my guidance and supervision and her approach to the research study has been sincere, scientific, and analytical.

Faculty Guide	School Dean
Professor Laxman Swaroop Sharma	Professor Rahul Ghai
IIHMR University, Jaipur	IIHMR University, Jaipur
01/07/2021	01/07/2021

Abstract

The study was undertaken for identifying and understanding livelihood interventions done by PRAGYA for the promotion of sustainable livelihood through formation of community- based organizations. The current paper uncovers the financial advantages for the people groups of the Uttarakhand state. The interest for therapeutic and fragrant plants of Uttarakhand is very expanded, and large numbers of these plants fill just in the Himalayan states. The State has different agro-geo environment conditions, which is generally reasonable for Medicinal and sweet-smelling plant development. Uttarakhand is honored with an assortment of soils and agro-climatic conditions, going from Sub-Tropical to Alpine, which is a uber biodiversity focal point for a wide scope of wild and developed Medicinal and sweet-smelling plants. Because of the depressed spot of rural creation, absence of mechanical turn of events, destitution, and joblessness, people groups move to misuse biodiversity to work on their socio-economy. There is a financial strain to relocate on the plain regions for better vocation openings.There are many sets of challenges that community cadres' face while implementation of those interventions. The data collected will be helpful to analyze present situation of women and Men farmers to enhance their productivity by improvement in current practices. This study is done to understand those challenges and gaps which hurdles are to empower them and make them self-reliant. So that there should be a proper step to take. Data was collected by interview schedule, personal observations, transect walk, focus group discussion. Also, this study is based on the secondary data because of inability to conduct primary research because of COVID-19 pandemic effect on the research process.

These provide not only social and economic benefit to them, but this helps them to supplement their family and society. They play pivotal role in contribution of rich cultural and livelihood security. In this paper it was tried to identify different type of livelihood activities done by tribal and all categories in the different villages of Pithoragarh, Uttarakhand. There are many sets of challenges that community cadres' face while implementation of those interventions. Community livelihood professional should be given capacity building to build up their confidence over their roles and responsibility.

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I would like to thank **Swayang Bikash Jena** State Assistant Project Manager, and **Ms. Reema Kachhap**, Block coordinator of JSLPS for giving time to me and extending their guidance, assistance, and coordination when I was in the field. I also thank my friends and classmates for their contribution in data analysis and their guidance, and all the staffs (IIHMR-U and PRAGYA) for all their continuous supports and guidance throughout this journey of the project.

I express my gratitude towards the villagers, Khetar Kanyal panchayat (where we have worked for Poor Families of Dry Ration Distribution), SDM Office, DM and Collector office Pithoragarh, who always welcome with love and supported me in every possible manner.

Contents

Acronyms

DM	District Magistrate
SDM	Sub Divisional Magistrate
NGOs	Non-Government Organizations
CBOs	Community Based Organizations
SHG	Self-Help Groups
GB	General Body
CEO	Chief Operating Officer
KMVN	Kumaon Mandal Vikas Nigam
GMVN	Garhwal Mandal Vikas Nigam
ICIMOD	International Centre for Integrated Mountain Development
ICAR	Indian Council of Agricultural Research
AYUSH	Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homeopathy
ISSCMAP	International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants
TRAFFIC	Trade Records Analysis of Flora and Fauna in Commerce
TMP	Traditional Medicinal Practitioners
SIRO	Scientific and Industrial Research Organisation
IHR	Indian Himalayan region
MAPs	Medicinal and Aromatic Plants
NBPGR	National Bureau of Plants Genetic Resources
CIMAP	Central Institute of Medicinal and Aromatic Plants
CSIR	Council of Scientific Industrial Research
TBGRI	Tropical Botanical Gardens Research Institute
DARE	Department of Agricultural Research and Education

1. Background

Uttarakhand came into existence on 9th of November,2000 and constituted 27th state of the Republic of India. The state is situated in the northern piece of India, and is situated between 28 °C 43' N to 31 °C 27' N (Latitude) and 77°C 34' E to 81 °C 02' E (Longitude), is notable for ample organic just as social variety. The all-out topographical locale of the state is 53,483 sq. Km.; it is parted into 13 areas inside two income divisions and one ancestral division. Also, the complete geological area, about 19% is under perpetual snow cover, ice sheets and steep slants. Furthermore, lined by the Indian province of Himachal Pradesh in north-west, by the Autonomous district of Tibet (China) in north-east, by Nepal in south-east, and by Uttar Pradesh (India) in south-west. Uttarakhand has a short boundary with Haryana in west.The state has been carved out from the erstwhile state of Uttar Pradesh by combining the hill districts of Uttarkashi, Chamoli, Rudraprayag, Tehri Garhwal, Dehradun, Pauri Garhwal, Pithoragarh, Bageshwar, Almora, Champawat, and Nainital with the districts of Udham Singh Nagar in the Terai region and Haridwar in the foothills. Blessed with the enchanting beauty of nature and for historical and mythological regions the state has its own uniqueness. About 60% of the area is covered by forests and is rich with numerous species of trees and herbs. And about 93% of the area is hilly, and the remaining 7% is covered by plains. Nature has endowed tis land with so much beauty and spiritual bliss that it is also known as “Dev Boomi”-the Abode of Gods.

The old-time belief and traditions of the ethnic tribes and people are deeply steeped into their dance forms and they represent their culture through this form. The art of the dancing here owes its motivation to the enchanting mythological young dancing women who have made the snowy mountains their homes and are depicted in the form of Paris. But who are these paries? Some people say that these dancing girls are the souls of the young single girls who had died without any cremation procedures; they were also believed to be the daughters of the evil king Ravan who had handled them over to Shivji as hand maidens. Another tradition regards them as a part of the legend and traditions of Krishna and depicting them as Gopis or Celestial dancers with Krishna Ji.

The climate of Uttarakhand are mainly Summers, Winters, and Monsoon.

(1) Summers: Summers, in most of the Uttarakhand are mostly pleasant, but some places do have hot climate. The temperatures, in places like Haridwar, Rishikesh, etc. can reach the 40 degrees Celsius mark. Coupled with humidity, this can be pretty uncomfortable. The summer season of Uttarakhand extends from April to June.

(2) Winters: Winters in Uttarakhand are very cold, with many places receiving regular snowfalls. Temperature during the winter season ranges from sub-zero to about 15 degrees Celsius. The winter season in Uttarakhand generally extends from October to February.

(3) Monsoon: During the period of July to September, lies the monsoon season of Uttarakhand. The temperature ranges from 15 to 25 degrees Celsius at the places, during this time. The state receives approximately 90% of its annual rainfall in this season. It is also one of the most pleasant seasons of Uttarakhand.

The all-out populace of the state is 1.01 Crores (Census 2012), with more than three-fourths of the all-out populace subject to agribusiness for their occupation. Restorative and Aromatic Plants comprise a significant fragment of the greenery, which gives crude materials to use in the drugs, beautifiers, and medication enterprises.

The interest for natural medication is expanding all through the world. Yearly turnover of natural medication in India is assessed at 1.7 lakh metric tons, for which 960 plant species are in dynamic exchange. Uttarakhand State is enhanced with timberland and important water assets. The populaces of high-elevation spaces of Himalayan locales have restricted alternatives to bring in cash for their day by day needs because of the uneconomic idea of oats creation i.e., low gets back from farming creation. Notwithstanding the plenitude of countless verdure, the majority of individuals are underestimated and still live on a means level.

Because of the depressed spot of rural creation, absence of modern turn of events, destitution, and joblessness, people groups move to misuse biodiversity to work on their socio-economy. There is a financial strain to relocate on the plain locale for better vocation openings.

Relocation from country regions in Uttarakhand is a difficult issue with a correlation between 2001-2011 evaluation information showing an exceptionally sluggish decadal development of populace in the greater part of the mountain locale of the state. We have the responsibility to conserve and cultivate the Medicinal and Aromatic Plants for maintain the socio-economic status of Uttarkhand.

Operational definitions:

Medicinal plants:

Medicinal Plants may be defined as plants and herbs which have possessed therapeutic properties or exert a beneficial pharmacological effect on the human or animal body. About a third of pharmaceutical drugs depend on alkaloids from plants, including fungi and bacteria. More than 60% of medicines are plant based. The significant families in which restorative plants are found are fabaceae, Euphorbiaceae, Convo;vulaceae, Malvacea, Asteraceae, Poaceae, Rubiaceae, and Sonanaceae Unsustainable and enormous scope gathering of MAPs from the regular natural surroundings without giving fair advantage to the neighborhood individuals and government is of grave worry to all. Subsequently, by reasonably utilizing and developing financially gainful MAPs, there is an abundant extension to keep up with both the rustic occupations and natural manageability. Guide based nearby miniature ventures can likewise overcome any issues between country poor and somewhat well-off metropolitan rich and advance social harmonization and sound climate preservation.

Social Perspective

Utilization of restorative plants in essential medical care and nourishment needs is conventional and imbedded in all societies. No serious issues of worthiness in regard to experience with the use of plant items, techniques for development of numerous usually

developed plants and innovations needed for handling into things of normal family uses and worth. Medications plants have additionally been utilized to foster family-based wellbeing and work arranged endeavors in provincial regions. Restorative and Aromatic Plants help in: a) Preserving the customary clinical information, b) Provide effectively versatile venturesome freedoms for jobless youth and provincial helpless who can take in the exchange from their folks and peers and acquire their business as well as add to the general public.

Imperatives and Opportunities in Cultivation:

A portion of the pragmatic applications incorporating therapeutic plants into conventional cultivating frameworks have taken a commit relationship in backstopping upland horticulture or blended cultivating. South Asian states have a rich and different customs of rehearsing unpredictable and rotational cultivating frameworks that

incorporates home grown plants development (Maikhuri, 2002) and subsequently, preservation and ex-situ development of therapeutic plants particularly applying natural cultivating conventions has an incredible breadth exceptionally to get to global business sectors. Other significant freedom and benefit of developing MAPs remember simplicity of their joining for the current trimming frameworks because of accessibility of countless species and decision of plant types i.e., trees, bushes, forbs, plants and their reasonableness to filled in various eco-physical conditions. To summarize, wild stock administration and development of painstakingly chose species as a blended, entomb or partner crops in agro and ranch ranger service conditions is practical and should be sought after. Nonetheless, to guarantee a decent info and administration conveyance framework including showcasing development may should be done in chosen pockets in a concentrated way. The present medical care frameworks depend to a great extent on plant material. A large part of the total populace relies upon customary medication to meet day by day wellbeing prerequisites, particularly inside agricultural nations. Utilization of plant-based cures is likewise inescapable in many industrialized nations and various drugs depend on or got from plant compounds. Essentially, beautifying agents and other family items may contain plants of restorative or helpful worth. The drug business is both huge and exceptionally fruitful. Deals

of plant inferred drugs are required to reach $30 billion worldwide in 2002. At present about half of the absolute plant-got drug deals come from single substances, while the leftover half come from natural cures. Albeit the last have more noteworthy volumes of utilization, the generally low volumes of single substances, which are for the most part solution items, are more than repaid by their greater costs. Single substance plant drugs, which for the most part treat genuine clinical ills, incorporate atropine, digoxin, morphine, paclitaxel, pilocarpine, reserpine, scopolamine, topotecan and vincristine, among numerous others. A few of the mixtures have outlasted their convenience considering better other options.

- **Aromatic Plants:** Aromatic Plants can be defined as a special kind of plant used for their aroma and flavour. Many of them are also used for Medicinal purposes. Aromatic compounds are present in plants in the root, wood, bark, foliage, flower, fruit, seed etc. The families Pinaceae among the gymnosperms, Apiaceae, Myrtaceae, Rutaceae, Lauraceae, etc. among the angiosperms, account for a large number of plants bearing essential oils of commercial importance.
- **Medicinal and Aromatc Plants:** Medicinal and Aromatic Plants" (MAPs) has been used in a slightly broader sense, distinguishing the fragrant (aromatic, ethereal) ingredients- containing group of medicinal plants. Natural environment has been a source of medicinal agents for thousands of years, since healing with plants dates back probably to the evolution of Homo sapiens. Even to date, about 80% of the world's inhabitants rely mainly on traditional medicines for their primary health care, while medicinal plants continue to play an important role in the health care systems of the remaining 20%. Partly based on their use in traditional medicine, an impressive number of modern drugs have also been isolated from natural plant species.

  The medicinal and aromatic plants for health can be found anywhere, in the wild place or inside the kitchen. People can find many hidden benefits when they put the seasoning into their meal. Some researchers find that Alium sativum or garlic can be used as an anti-cancer. The Alium cepa or onion is good to for human's body because it increases the system immune. Besides, the spices are good for body to keep the digestion, blood circulation and immune system. With the right treatment, people can get optimal active compound contained in those seasonings. This can be a good prevention from

many diseases. The international journal Medicinal and Aromatic Plants covers all aspects of medicinal crop cultivation, medicinal uses of plants, their active ingredients and related industries. This journal promotes the interdisciplinary exchange of knowledge and ideas in medicinal plant crops and related industries. The journal aims to provide the most innovative, original and rigorous developments in research and industry, thereby, to set the standards. Interdisciplinary studies of fundamental problems on the subject are given high priority. The structure of the journal takes into account the broad scope of R&D in medicinal & aromatic plant crops research and industry.

- **Importance of MAPs:** MAPs are very importance for human as well animals as per the medicinal point of view. During the last two decades, medical systems have undergone tremendous changes in the world. Due to the toxicity of antibiotics and synthetic drugs, Western countries are increasingly aware of the fact that medicines derived from natural sources are far safer. Therefore, they also turning to natural sources of medicines. There are the following importance of MAPs like that (i) Medicinal Value (ii) Aesthetic Value(iii) Religious Value (iv) Use as Spices (v) Cosmetic use (vi) Industrial Development (vii) Employment Generation and (viii) Income Generation (ix) Sources of foreign exchange etc.

Uttarakhand

Uttarakhand is the 27th State of Republic of India, Uttarakhand that was shaped in the year 2000 subsequent to being isolated from the enormous State of Uttar Pradesh, is a location to investigate the wealth of Indian Culture, history, and regular magnificence. Uttarakhand has the nickname 'Devbhoomi' meaning "The Land of the Gods". It was formerly called "Uttaranchal".

Dehradun is the Capital of Uttarakhand. Important hill satatios are Mussoorie, Nainital, and Ranikhet. The slopes of the hills are covered with forest. This forest provides to a variety of birds and Animals. Language of Uttarakhand are basically Hindi, Pahari, Garhwali, and Kumaoni. Gangotri, Yamunotri, Badrinath, Haridwar, and Kedarnath are Places of religious.

Date of Formation: 9th November 2000

Uttarakhand State is divided into two divisions which are further divided into 13 Districts.

Population:10086292

Population Density:189 Persons per square Km.

CM of the Uttarakhand State is Tirath Singh Rawat and Governor is Baby Rani Maurya (since 2018).

Rivers: Ganga, Yamuna, Ramganga, and Kali and all.

There are the Forest and wildlife Sanctuaries also in Uttarakhand State named as Nanda Devi National Park, Rajaji National Park, Corbett Tiger Reserve.

Tourist Attractions: Corbett NP Established in the year 1936, it is India`s oldest National Park. Nainital, Mussoorie, Almora valley of Flowers, The Valley of Flowers is a UNESCO World Heritage Site and Nada Devi National Park was declared a UNESCO World Heritage Site in 1988. And Robber`s Cave is also famous for Tourist Attraction.

Rishikesh is known as 'The Yoga Capital of the World'.

There are some of the Famous festivals of Uttarakhand named as Devidhura Mela, Nanda Devi Mela, Purnagiri Mela.

There is a Tehri Dam on the Bhagirathi river is the highest Dam in India. And Nanda Devi is the second highest mountain peak in India.

Gurudwara Sri Hemkund Sahib is a pilgrimage for Sikhs at an elevation of 4632m above sea level, it is the Highest place of Worship in the World. And Haridwar is the holiest place for Hindus. The Badrinath Ji temple is one of the four CHAR DHAM sites of pilgrimage for the Hindus. Badrinath Ji, Kedarnath Ji, Gangotri and Yamunotri from the Chhota Char Dham pilgrimage for Hindus. Tungnath temple at an altitude of 3680m above from the sea level is the Highest Shiva temple in the World. The 'Tungnath' literally means Lord of the peaks.

Major Dance Form and Music: Garhwali Folk dance and Music.

Art and Crafts: Kholi Woodcarving and Aiper or Rangoli.

There are some of the Languages of Uttarakhand are Hindi, Garhwali, Kumaoni

Note: - Uttarakhand is the only Indian State to have Sanskrit as one of its official Languages.

State Animal of Uttarakhand is Himalayan Musk Deer and State Bird is Himalayan Monal Pheasant, this is also the National Bird of Nepal.

State Flower is Brahmi Kamal and State Tree is Burans

Major Crops are Rice, Wheat, Barely, Jawar, and Oilseed.

Pithoragarh

Pithoragarh is one of the Famous Districts of Uttarakhand State. It shares border Internationally with China (Longest Border) in North, South east is Nepal, in South Champawat, and some of the Districts of Uttarakhand such that, Chamoli, Bageshwar, and with some part of Almora. It consists six Tehsils, and We are working in these Tehsils named as Pithoragarh, Didihat, Gangolighat, Berinag, Munsiari, and Dharchula. Pithoragarh District is situated in the Soar Valley (50Km Sq.) and average Elevation is 1514m. Named after its headquarters town, Pithoragarh, It was also the Part of Champawat, During the reign of the Chand Rajas of Kumaon, one Piru, also calld Prithvi Gosain, built a fort here and named it Prithvigarh which, in the course of time, got change to Pithoragarh. Pithoragarh District is the Easternmost District of Uttarakhand, and Here we can hgh Himalayan Mountains, Snow-capped peaks, Passes, Valleys, Alpine meadows, Forests, Waterfalls, Glaciers, and all. Pithoragarh has the rich ecological diversity, and It makes Strategic Importance because it shares border Internationally in Ttibet open for Tibet near Lipulekh, Kungibingari, Lampiya Dhulra, Belcha, and Keo. And Pithoragarh Popular for its exquisite natural beauty and widely known as the “Little Kashmir”.

PRAGYA

A non-administrative improvement association set up in 1995. Started in worldwide South. Activities in India, Kenya, Nepal, UK, US.

We address the development needs of fragile ecosystems and deprived and marginalised peoples in the most underserved areas in the world that lie in the shadow of policy & development attention.

A Dual Mode Approach

Implementation of Development Projects in underserved regions for the benefit of marginalised people Design and Infusion of appropriate Development Models and Capacity Building of Development Actors

Facilitating appropriate & sustainable development of communities, catalysing & empowering stakeholders to enable change through grassroots action

Policy Studies for particularly disadvantaged peoples & regions Advocacy and generation of Development Awareness among policymakers & the developed world

Engendering wider awareness and promoting supportive policies at national and international levels

Special Consultative Status with UNECOSOC (ECONOMIC & SOCIAL COUNCIL OF THE UN)

Recognized as a 'SCIENTIFIC & RESEARCH ORGANIZATION' (DEPT OF S&T, GOVT. OF INDIA)

Natural Resource Management Disaster Management Enterprise & Livelihoods Development Appropriate Technologies Rights, Welfare and Social Development

PRAGYA Programme Areas

Biodiversity conservation & sustainable use of Himalayan forest wealth, wetlands & grasslands; Disaster preparedness, relief & rehabilitation

Development & infusion of technologies for energy, water, sanitation, construction material/methods

Improving incomes for marginalised groups, and developing suitable alternative livelihoods, along with economic enablers.

Improving gender equity, education, healthcare, other services. Improving access to rights and effective political participation.

Jammu & Kashmir Himachal Pradesh Uttarakhand Arunachal Pradesh West Bengal Communities Served in India.

Target Groups

- Children, Youth, Women and Girls
- Small & marginal farmers and their families
- Pastoral nomads and their families
- Migrant workers and their families
- Urban poor and internally displaced people

Grassroots Action:

Pragya works across India with field offices in 12 northern states & UTs for project implementation in:

- marginalised rural areas
- urban slums & peri urban settlements

Capacity Building & Advocacy:

Pragya builds capacity in 124 less-developed districts with lowest Human Development Indices. Pragya also conducts advocacy in associated States and at national level on critical issues in these areas.

Development Awareness:

Pragya works to develop awareness of development issues among the wider public.

Dedicated to working for disadvantaged peoples since 1995, 20+ years of programming & research experience.

Outreach to 150,000+ people in Backward Districts across India.

Grassroots connect through Field Offices & Resource Centres.

Supported by leading donors: EC, DFID, World Bank-UNDP, UNDEF, IUCN, GOI Ministries. GuideStar India Platinum Certification.

Diverse portfolio of programs spanning Livelihoods; Disaster Management; Education & Health; Women's Issues; Environment; Energy, Water, Sanitation.

Internationally lauded for innovative & impactful programs on Environment, Education, Energy.

Pathbreaking Research and Innovations:

Community-based Surveillance of Maternal & Child Health; Education Information System for Marginalised Schools; Himalaya-specific Disaster Management; Critical research on Climate Change.

Highlights of our work DRCs and Skills Development

Climate-smart agriculture development

Innovative Youth-based extension services for weather information and climate-smart agriculture. Farmer experts harnessed for Farm Research Stations for Agri-adaptation.

Renewable energy for village electrification

Innovative Solar-wind micro-grids for rural electrification. Rural tech-shops and barefoot engineers for technical supplies/services in out of reach areas.

Medicinal plants conservation & livelihoods

Herb-cultivation by small farmer cooperatives. Buy-back agreement with Dabur. Strategy design for National Medicinal Plants Board. Community based conservation.

Participatory Disaster Management

Community Disaster Response Teams for risk governance and Early Warning in hazard-prone areas. Relief & rehabilitation support to flood & drought victims. Advocacy at national and State levels for ecosystem-based disaster risk reduction.

Farm sector development

Innovations in agriculture and irrigation for improved crop productivity and wasteland reclamation. Agri clinics and nurseries, farmer cooperatives and Agri-processing and marketing promotion- to benefit small & marginal farmers.

Mobile Schools and Educational Quality Improvement

Mobile schools delivering basic education to migrant workers' children. Education monitoring system for improving education quality in 135 educationally backward districts- trialled in 11 tribal districts.

Empowering women and girls

Educating women and girls on their rights and enabling them to resist violence. Women leaders and task forces for women's protection & advancement. Local mentors for propelling social & attitudinal change towards gender equity.

Community-based Health and Nutrition

Health & Nutrition Surveillance Kits and trained village health workers for monitoring, early detection and timely care. Village Women's Care Groups for antenatal & postnatal wrap-around support.

Vocational skills and enterprise development

Vocational courses for youth for skill-building in niche-sector livelihoods, via Resource Centres in backward areas. Microenterprise development model (SIDBI-approved) and business cluster development.

Safe water and sanitation development

Multiple innovations for harvesting, storage and purification of water, including spring revitalization, anchored with women's groups. Toilet construction and behaviour change programs.

Pragya is a non-governmental development organization established in 1995. Initiated in the global South, our current operations span India, Nepal, Sub-Saharan Africa, UK, and USA.

The Pragya mission:

'To shape & enable holistic, sustainable development with a focus on vulnerable and neglected communities and ecosystems.'

Pragya works for the development of fragile ecosystems and vulnerable communities in the most remote and difficult areas of the world that lie in the shadow of policy & development attention. The organization was set up with a concern for last-mile communities neglected and marginalized in the development process, and unique ecosystems (frequently the two converge) that suffer the destruction brought about by overuse of resources and inappropriate development. Our initial grassroots work was focused on the high-altitude belt of the Himalayan region across India and Nepal. Today, we have reached out to remote regions and isolated communities in other continents in our drive to address the development needs of all such areas and people in the world.

Our Work

Pragya works to reach the benefits of development to the most remote and least developed regions, delivering an array of development services to isolated and underserved communities, and building their capacity to help themselves. We also research and support reform of programs and policies, and advise and train development actors, in order to spur development action in these regions.

Pragya has delivered several successful projects and its work has been supported by various international trusts and foundations, multilateral bodies, as well as government. Our work has been recognized internationally for its innovative character and impact.

¬ Whitley Award for Nature Conservation (2000) for work on medicinal plants conservation.

¬ Action Station of the Royal Geographical Society (2000) for conservation research in the Himalayas.

¬ Energy Globe Award (2005) for work on renewable energy technologies for rural electrification.

¬ STARS Impact Award (2010) for work on education of children of migrant workers.

Introduction.

People who live in and near the forest have a close connection with the forest and forest products, since more than 2 billion people worldwide rely on the forest for their livelihood (UNDP, 2000). This combination has led to a build-up of vast knowledge of different applications and environmental interrelationships between plants (Johnsy et al., 2012). The natives have known the use of medicinal and aromatic plants (MAPs) from the time of their existence to prevent, cure and treat various illnesses of humans and animals (Borchardt, 2002). Of the approximately 391,000 plant vascular species, 30,000 have at least one recorded application, with about 17,810 being utilized as medicines (Kew, 2016). In the developing nations, according to the WHO (1993), 3.5 billion individuals routinely use MAPs, representing 80 percent of the overall use of MAPs. Since ancient times, socio-cultural activities, such as plant worship, groves and landscarve promote the application of traditional plant-based knowledge by local people (Kala, 2005a).

Approximately 4,635 ethnic community groups in India employ around 8,000 species, including more than 1 million folk healers (WWF, 2007). The quantity of traditional knowledge that is currently being shared across various groups in different areas is a consequence of exchanging knowledge (Gazzaneo et al., 2005). Traditional knowledge contributes not only to preserving cultural assets and the environment but also to generating livelihood and revenue (Impey, 2002). The most significant comparably important MAPs (Dirzo and Raven 2003), which represent the historical significance of MAPs for Indians and Chinese are two major nations in Asia, India and China.

Most traditional herbal medicinal systems, including traditional folk medicine, have become trade through time (Kala, 2009). Global herbal trading is estimated at 120 billion dollars, reaching 7 trillion dollars by 2050 with China, India and Germany making the most contribution (240,000 tonnes, 80,000 tonnes, 58,000 tonnes per year). A total of about 2500 species have been estimated for MAPs in international commerce (Olsen, 1998), of which 880 are usually employed in India for trade (Tondon and Yadav, 2016). The Indian MAPs trade value was approximately US$ 5.5 billion (Exim Bank Report, 1997), a rise of 9.2 percent in export values between 2001 and 2014 at an annual average growth rate (Vasisht et al., 2016).

Traditional Medicinal Systems in India

Ayurveda, Siddha, Unani, and Homeopathy are just a few of the Indian medicinal systems that utilize MAPs (Nadkarni, 1996). Ethnobotanical pharmacology was created in Ayurveda between 2500 and 600 BC (Mishra et al., 2001). Plant and animal components, as well as minerals and metals, are always included in Ayurvedic medicinal medicines (Samhita and Samhita, 2009). The Charak Samhita (900 B.C.) contains comprehensive therapeutics, the Sushruta Samhita (600 B.C.) focuses on surgery, Ashtang Haridaya (700 A.D.) focuses on principles and practices of medicine, Madhava Nidana (800-900 A.D.) containing referentials, and Bhoja Prabandha (980 B.C.) focuses on principles and practices of medicine, and the Bhoja Prabandha (9 (Saraf and Parihar, 2007). Charak, Dhanwantri, Sarangdhar, and Bhavpraksh are examples of traditional treatments that make use of effective natural drug combinations (Ranade and Desai, 2005).

Similarly, the Siddha system originated in the Indus Valley Civilisation and was brought to South India by Dravidians (Krishnamurthy and Mouli, 1984). The approach is based on old medicinal methods, spiritual disciplines, alchemy, and mysticism, among other things (Rao and Veluchamy, 1983). Unlike Ayurveda, siddha medicine stresses the use of herbs and minerals in combination, as well as the acknowledgment of Vaadham, Pitham, and Kabam in childhood, maturity, and old age, respectively, while Ayurveda emphasizes Kabam in children, Vaatham in old age, and Pitham in adults (Subbarayappa, 1997).

The Unani Medicinal System, which was utilized by the Mughals in India in the 13th century, was influenced by Sushruta and Charaka, and Hakims were practitioners of this medicinal system (Syed and Zillur, 2001). The Unani system, which utilizes MAPs, is the country's second most well-known medicinal system after ayurveda. Homeopathy was introduced to India in 1835 by Roman Dr. John Martin Honigberger. Homeopathic remedies include animal, plant, mineral, and synthetic components (Mathei, 2003). Naturopathy was revived in India in 1894, when D. Venkat Chelapati Sharma translated from German Shri. Louis Kuhne's book "New Science of Healing" (AYUSH, 2013). Vitalism and self-healing are the cornerstones of this medical approach. The approach emphasizes MAP-based food and lifestyle practices, as well as cleansing methods such as hydrotherapy, baths, and massage (Shrivastava et al., 2015).

AYUSH has named Sowa Rigpa as one of India's most important medical systems. The "Amchi System of Medicine," which has a lengthy history, is another name for this. The establishment

of this medical school was influenced in the 7th century by the exporting of Indian medical knowledge, as well as Buddhism (Namgyal and Phuntsog, 1990). Amchi, also known as the Tibetan traditional healer, employs plant and animal-based medicinal treatments as well as mineral combinations in his practice (Navchoo and Buth, 1989). The utilization of plants to cure various diseases, illnesses, and heal wounds through observation, accidents, philosophy, traditions, and reasoning has been the apparent foundation of all of these medicinal systems in India (Nadkarni, 1996; Kala, 2005a).

The Ministry of AYUSH of the Government of India now has 7.37 lakh registered medical practitioners who practice traditional medicine. There are 3.99 lakh Ayurvedic practitioners, 2.8 lakh Homeopathic practitioners, 47683 Unani practitioners, 8173 Siddha practitioners, 1764 Naturopathy practitioners, and 21 Sowa- Rigpa clinics (AYUSH Report, 2013). Aside from practitioners, India has about 9000 registered and licensed manufacturing companies, with 90% of them being in the cottage and small-scale industry (AYUSH Report, 2015). The annual domestic commerce of the AYUSH sector is in the region of INR 80-90 billion, with annual increase of 20-25 percent anticipated, with the mountain states contributing the most (AYUSH Report, 2013).

Uttarakhand Herbs and Aromatic Plants Production

Uttarakhand, located in the Himalayan foothills, has a diverse physical landscape, ranging from snow-capped high peaks in the north to tropical rainforests in the south. Garhwal Mandal in the west and Kumaon Mandal in the east have been divided into two areas. Approximately 61.1 percent of the state's territory is covered in forests. In the 2012-2013 fiscal year, the state exported 29.0 crore worth of culinary herbs and aromatic goods. (shm.uk.gov.in). A wide variety of herbs, medicinal plants, and aromatic plants may be found in Uttrakhand. The administration intends to take use of this edge. In Uttrakhand, the area under cultivation of aromatic and medicinal plants has expanded. The number of farmers growing fragrant plants in Uttrakhand has increased dramatically, from 301 in 2003-04 to 2714 in 2006-2007, while the area under aromatic plants has increased tenfold. (forest.uk.gov.in)

In 1989, the Herbal Research & Development Institute in Gopeshwar was recognized as the main agency for conservation, development, and sustainable use of Uttrakhand's

vast Medicinal and Aromatic Plant resources, with responsibility for the MAP sector's many aspects. The following are the major changes: (2010, Tribuneindia.comEach block has three nurseries.

Each region has its own herbal garde Rishikesh, Tanakpur, and Ramnagar have 70 collecting centers linked to mandis.)

Human resources for research and development.)

Farmers will get instruction in herbal growing and post-harvesting methods.)

Content certification at labs in Selaqui and Gopeshwar

The State Plant Board was established in the

capital.

Species	**Percentage**
Herbs	**32%**
Shrubs	**20%**
Trees	**33%**
Climbers	**12%**
Other	**3**

The distribution of medicinal plants by their habit in Uttarakhand

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Endangered medicinal plants

Plant segments like leaves, bark, roots, organic products, seeds, and at times the entire plant are taken unpredictably from regular sources without respect for the plants' endurance. Due to over-misuse and territory debasement, many key useful species are near the precarious edge of annihilation. Over 95% of therapeutic plants are reaped from the wild, and many have gotten jeopardized in their local natural surroundings. The development and supporting of these plants should be empowered. The accompanying species ought not be gathered from normal sources.

Techniques for protection of therapeutic plants

The preservation of the wild therapeutic plants or some other such compromised species can be handled by logical methods just as friendly activities.

There are fundamentally three logical methods of protection of hereditary variety of these plants.

A. Legislation

B. In-situconservation

C. Ex-situconservation

Lagislation: There are no different arrangements or guidelines for saving therapeutic plants filling in timberlands in India. There protection is covered under existing laws relating to ranger service. Adhering to are the laws planned by legislature of India for preservation of woodlands which straightforwardly or in a roundabout way ensures the wild natural vegetation.

a. Forest Act, 1927

b. Wildlife (Protection) Act 1972 and Wildlife (Protection) Amendment Act 1991

c. Forest (Conservation) Act, 1980

d. Environment Protection Act, 1986

e. National timberland strategy, 1988

f. National biodiversity act, 2002

The planned clans and other customary backwoods tenants act, 2006

In-situ preservation

a. Conservation of a given animal categories in its normal territory or in the space where it develops normally is known as in-situ protection.

b. It incorporates Gene bank/Gene authorize, Biosphere holds, public parks, consecrated locales, Sacred scores and so forth

c. It is just in nature that plant variety at the hereditary, species and eco-framework level can be rationed on long haul premise

d. It is important to monitor in particular, agent biogeographic zones entomb and intra-explicit hereditary variety.

The 'in-situ' or on location protection, in which a wild animal types or load of an organic local area is shielded and kept up with in its regular habitat, is the most financially savvy technique for saving existing natural and hereditary variety. The upside of an "ecocentric" procedure over a "species-focused" approach is that it keeps species from getting jeopardized because of human exercises and diminishes the requirement for human mediation to stay away from untimely annihilation. 'In-situ' preservation strategies incorporate the formation of biosphere holds, public parks, untamed life safe-havens, blessed forests, and other secured places. At the public, worldwide, and worldwide levels, the idea of making a secured region network has become the dominant focal point in all strategy dynamic cycles associated with biodiversity assurance.

The most usually alluded in situ preservation strategies are featured underneath:

1. Biosphere Reserves: The Ministry of Environment and Forest, Government of India, had distinguished 14 biosphere holds dependent on overview information and 7 of them have effectively been made functional at this point.

2. National Parks: Out of an aggregate of 91 National Parks in the country, 2 have been set up in Himachal Pradesh, that is, Pin Valley National Park and Great Himalayan Park in the regions of Lahaul-Spiti and Kulu, individually.

The other integral techniques for in-situ protection are:

On-Farm Conservation:

i. On-Farm Conservation includes the upkeep of customary yield cultivars (land races) or cultivating frameworks by ranchers inside the conventional horticultural framework. Customary ranchers use land races, which are created by the rancher and all around adjusted to the neighborhood climate. This technique for protection has been acquiring significance as of late, however ranchers have utilized it for quite a long time. If there should be an occurrence of agro biodiversity, the impacts of producers rehearse are of fundamental significance. Foundational documentation of ranchers' information on variety and uses is required.

ii. Home Gardens: Home nursery preservation is basically the same as on-ranch protection, be that as it may scale is a lot more modest. In provincial circumstances, home nurseries will in general contain a wide range of animal categories like vegetables, organic products, therapeutic and flavor plants.

iii. Zero energy input-based idea of parafrost protection in the Himalayan area which stays covered with snow.

Frameworks for In-Situ Management

A. The Parks Department ought to set up an approach at public level on the preservation and use of restorative plants in ensured regions.

B. The strategy ought to include:

C. Identifying which of the secured regions are generally significant for therapeutic plants.

D. Targets and strategies for recording and checking restorative plants in secured regions.

E. Techniques and techniques for assortment of restorative plants inside secured regions.

F. The Parks Department ought to survey the degree to which the secured regions framework covers the restorative plants of the country. It should then make new secured regions and stretch out existing ones to guarantee that every one of the restorative plants of the nation are saved. The Parks Department should devise financial and social motivators for keeping up with normal territories and wild species.

G. Park administrators ought to guarantee that the protection and misuse of therapeutic plants are consolidated into site the executive's plan.

H. Species that are vigorously exhausted by over-assortment ought to be once again introduced into regions where they once developed wild.

Ex-Situ Conservation

Ex-situ (outside of ordinary region) insurance of therapeutic plants can be refined by creating and staying aware of plants in botanic nurseries, parks, and other sensible regions, similarly as long stretch protection of plant propagules in quality banks (seed banks, dust banks, DNA libraries, etc) and plant tissue culture vaults, similarly as cryopreservation.

Field quality bank (field vault/clonal document)

i. (Gene Bank: Storage as seed (Base variety at - 20°C; Active combination at +4°C to l0°C). The three public quality banks have been set up in India for ex situ conservation of remedial and sweet-smelling plants.

ii. National Bureau of Plants Genetic Resources (NBPGR), New Delhi, under ICAR.

iii. Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow, Uttar Pradesh, under the Council of Scientific Industrial Research (CSIR), Ministry of Science and Technology, Government of India.

iv. (Tropical Botanical Gardens Research Institute, (TBGRI), Palode, Thiruvananthapuram (Kerala).

The security of inherited capriciousness of created plants and their wild relatives is the sole commitment of the National Bureau of Plant Genetic Resources (NBPGR) that works under the Indian Council of Agricultural Research (ICAR), Department of Agricultural Research and Education (DARE).

Seed quality bank

Seed Gene Bank's germplasm preservation is more financially savvy. The National Gene Bank (NGB) is housed at the NBPGR in New Delhi, and it is primarily answerable for the drawn-out seed stockpiling of agri-plant crops and their wild cousins. These are known as the "Base Collection," and they are kept in - 20°C modules. The seeds are dried to a dampness level of 4-6 percent prior to being enclosed by dampness verification aluminum foil bundles. Seeds that have been saved for 50 to 100 years are as yet reasonable. Just seeds tests with over 85% seed practicality are treated in many harvests. The seeds in the quality bank are kept in a perfect world as indicated by the FAO/IPGRI quality bank rules.

Public dynamic germplasm locales

The organization's center part is the public dynamic germplasm destinations (NAGS). ICAR foundations (crop-based establishments for a specific yield or set of harvests) and SAUs are home to 40 NAGS right now. These are a significant segment of the public organization for plant biodiversity security. The NAGS is accountable for increasing, assessing, keeping up with, and saving dynamic assortments, just as their spread to genuine clients at both the public and worldwide levels. These dynamic/working assortments are kept in modules with a temperature of +4°C and a general stickiness of 35-40%. (RH). Seeds are expected to get by for 15 to 50 years at these temperatures. The dampness content of the seeds is decreased to 8 to 10% for medium-term safeguarding. To help the dynamic germplasm preservation endeavors of the districts, the NBPGR keeps an organization of II provincial stations arranged in different agroclimatic zones all through the country.

Cryopreservation (in fluid nitrogen at-165°C to-196°C)

Cyro protection or freeze safeguarding under fluid nitrogen.

a. **Seed Preservation:** Based on their response to parchedness, the seeds have been separated into two gatherings. 3 The greater part of them, known as 'Universal,' are drying up safe and accordingly might be saved for broadened timeframes. The second class of plant species is known as 'Headstrong,' implying that their seeds are harmed during drying and in this manner can't be kept at freezing temperatures.

b. Pollen Preservation: Pollen stockpiling was basically evolved as a strategy for controlling fertilization of plants with simultaneous sprouting, especially in natural product tree species. Dust stockpiling has additionally been promoted as a promising new strategy for hereditary protection. 3-6 Pollen might be accumulated and cryopreserved in immense numbers in a little measure of region.

c. Exchange of germplasm through dust presents less plant isolate issues. As of late, cryo-protection strategies have been created for dust in countless species7 and cryo-bank of dust has been set up for natural product tree species in a few countries.8

Professional flowerbeds/arboreta

A professional flowerbed is where you may track down a recorded assortment of live plants for logical investigation, preservation, show, and educating. 9 They are germplasm storehouses, particularly for uncommon and imperilled native and outsider germplasm assortments. 10 Botanic Garden Conservation International (BGCI), a non-benefit association situated in London, UK, was established in 1987 to advance overall collaboration and observing of greenhouse protection programs. The Botanical Garden Conservation International (BGCI) has 500-part professional flowerbeds in three countries across the globe. 9 According to the BGCI data set, there are around 1,846 professional flowerbeds all through the globe. In India, there are around 140 greenhouses, including 33 professional flowerbeds partnered with 33 college organic science divisions. In any case, just around 30 greenhouses have a protection program set up. The Tropical Botanical Gardens and Research Institute (TGBRI) in Kerala, which is arranged in a debased backwoods space of the Western Ghat Mountains, is an extraordinary illustration of ex-situ plant assortment protection in India.

Traditional Medicinal System in Indian Himalayan Region (IHR)

The Himalayan mountain chain is home to a varied variety of floral and faunal diversity, as well as a wide range of climate variances, different social cultures, and ecological distinctions, as well as a wealth of traditional wisdom (Butt and Price, 2000). There are 8000 angiosperms, 44 gymnosperms, 600 pteridophytes, 1737 bryophytes, and 1159 lichens in the Indian Himalayan region (IHR) (Pramanik and Bhaduri, 2016). Approximately 1748 MAPs (23.2 percent of India) exist, with about 31% native, 15.5 percent endemic, and 14% endangered (Samant et al., 1998). Traditional knowledge regarding MAPs is widely known in the IHR's diverse cultural environment, which includes more than 139 tribes (Nandy et al., 2006). Many ancient medical systems, including as Ayurveda, Homeopathy, Unani, and Tibetan medicinal systems, are prevalent in the IHR area. In the area, around 89 percent of the population depends on these medical systems (Rai et al., 2000). Aside from the vast variety of MAPs and widespread reliance on them, the Himayalan area is a hub for several herbal manufacturing

businesses. IHR is home to 12% of all AYUSH manufacturing facilities, with 55 percent of those in various regions of India relying on IHR's MAPs (AYUSH, 2015). Traditional medicinal methods used by vaidyas (Ayurvedic practitioners), amchis (Tibetan practitioners), and hakims (Unani practitioners) in the IHR are important for local people's well-being, resource conservation, and socioeconomic development (Samal et al., 2004). The IHR is a storehouse of traditional medicinal knowledge that helps mountain people in this area survive (Kumar and Monga, 2013). The importance of medicinal and aromatic plants (MAPs) in Himachal Pradesh

Himachal Pradesh, one of India's states, is a significant component of the Himalayan mountain environment, with a varied flora that includes MAPs, which have played a vital role in rural people's socio-cultural and spiritual activities for generations (Ranjana et al., 2008). There are 643 medicinal plants in the state, 269 of which are native, 374 of which are non-native, and 17 of which are endemic (Dhaliwal and Sharma, 1999; Samant and Pal, 2003). According to Forestry Statistics India (2011), approximately 376 MT of medicinal herbs are harvested yearly in Himachal Pradesh, valued at up to 265.75 lakh rupees. Every year, around 165 MAPs are traded, with 24 MAPs in the top 100 plants sold in the nation. The state gets about INR 40 lakhs from the yearly harvest of medicinal plants, which totals more than 2,500 tonnes. On average, the collector's family economy receives approximately INR 14,000 per year from the transaction (Kapta, 2006). The majority of the MAPs gathered from the state's forests and farmlands have a well-established market in Amritsar's Majitha Mandi and New Delhi's Khari-Bawli. Calcutta, Saharanpur, and Mumbai are among of the MAPs' other marketplaces (Shilpa et al., 2015).

Aside from the sequential trading of MAPs, Himachal Pradesh is home to a variety of tribal tribes, including the gaddis, kinnaura, lahaula, bhotia, swangla, and gujjars, who are well-versed in biodiversity-based traditional knowledge and practices (Chaudhuri, 1992). People have been using herbal remedies to treat a variety of illnesses using traditional knowledge (Uniyal et al., 2006). The mountain people's sustenance has been based on indigenous knowledge and formulations (Gupta et al., 2014). They are well-versed in finding, using, collecting, and conserving MAPs in natural settings. The cultural and ecological themes are used to assess the local conservation and sustainable harvesting practices of MAPs. The utilization of traditional knowledge by these indigenous groups not only provides evidence for

the development of Indian medical systems, but it also plays a critical role in knowledge transmission to future generations (Mehta, 1995).

Review of literature.

In a research on traditional knowledge systems of certain tribes in the Bhagirathi valleys of the Garhwal Himalayas, Nautiyal et al. (2001) identified over 220 wild plant species utilized by Bhotiya groups, of which 80% were used for medicine, either directly or indirectly. Tiwari (2000) investigated non-timber forest products and their patterns of use in tribal-dominated regions in the north-eastern Himalayan region. Bhattacharya and Patra (2004) contrasted the north eastern and western Indian tribes, emphasizing the importance and potential of medicinal plants for rural women and child health care.

Chaurasia et al. (1999) performed an ethno-medico-botanical study in Ladakh's Nurba valley, documenting 36 plant species with ethno medicinal characteristics, including botanical name, local name, family, location, altitude, short comments, and particular applications. Among the 18 tribal groups in the Darjeeling Himalayas, Yonzone & Yonzone (1997) identified the ethnobotanical applications of 18 plants for food, medicine, paper, insecticides, and other reasons.

Local women in Banjar Taluka, Kullu district, utilized 34 plant species regularly for medical purposes, according to Natarajan et al. (2000). The state has also been home to a number of commercially important species in the pharmaceutical industry. In the year 2000, Singh and Kaushal collected information on the traditional usage of 14 medicinal plants that the Gaddies of Kangra valley utilize as veterinary medication by producing powder, paste, aqueous extract, decoction, and other methods. Verma (2000) found 250 ethnobotanical species in Himachal Pradesh's Kunihar forest division, divided into 213 genera and 80 families.

In the Nahan area of Himachal Pradesh, Nilay (2004) performed a research on the distribution and significance of MAPs, documenting a variety of traditional and contemporary health treatments for 403 species. The therapeutic applications of 43 plant species in the Lahual valley were described by Singh and Chauhan (2005). Sharma and Lal (2005) described indigenous medicinal applications and other traditional uses of nine plant species utilized by Himachal Pradesh residents.

Kapahi (1990), Aswal and Mehrotra (1994), Sood et al. (2001), Badola and Pal (2003), Kala (2005a), and Singh and al. (2005) conducted ethnobotanical research on the MAPs of the cold desert (2009). In all, 354 MAPs from 208 species and 78 families have been identified as ethnobotanically significant in the cold desert region. In the Lahaul Spiti region, Lal and Singh identified 18 MAPs for treating skin diseases in 2008.

Kumari et al. (2012) investigated the usage of non-timber forest products in tribal and non-tribal populations in Himachal Pradesh's Kinnaur, Lahaul, Bharmour, and Pangi (tribal region), Shilai, Churah, Parvati valley, and Chhauhara (non-tribal but isolated area). Rani et al. (2014) investigated the MAPs plants of Kangra area, which are utilized by the locals to treat a variety of illnesses. According to the research, approximately 34.37 percent of the leaves were utilized to treat health issues.

The population, distribution pattern, endemism, and usage of medicinal plants in Himachal Pradesh were investigated by Samant et al. (2007a). A total of 643 medicinal plant species were discovered throughout the research. Singh et al. (2008) investigated the variety of MAPs in Rohtang Pass, identifying 50 plant species from 15 families. Bergenia stracheyi had 22 individuals per meter, Picrorhiza kurrooa had 19.83 people per meter, and two Rhododendron anthopogon had 26.23 individuals per meter, according to the research. Aconitum heterophyllum has the lowest population density (1 individual/m2). The research also discovered that medicinal plant distribution was very habitat specific.

Singh and Samant (2010) performed a research in the Lahaul valley to represent significant MAP habitats and communities, reporting 15 habitats and 14 communities between 2490 and 4000 m. The species lavishness, local, endemic, financially significant, and undermined status of the biological systems and networks were totally thought of. The best protection need record was found in the Abies pindrow - Pinus wallichiana blended, Fraxinus xanthoxyloides, Picea smithiana - Pinus wallichiana blended, and Cedrus deodara - Acer cappadocicum blended networks (CPI).The greatest CPI value was observed in a shady wet environment with highly valued MAPs.

Factors that influence the variety of MAPs

A Literature Review

Aside from floristic research, other significant topics to study include the connection of MAPs with environmental factors, regeneration state, and the impact of human activities on MAPs. Several studies have been conducted to determine the relationship between plant population size and survival, regeneration, growth, and richness (1984), Khan et al. (1987), Rawat and Singh (1988), Condit et al. (1998), Case (2000), Caswell (2001), Bhuyan et al. (2003), Kumar and Ram (2005), Khumbongmayum et al. (2006), Lodhiyal and Lodhiyal (2012), Raturi (2012), (2013).

Sharma (1996), Parrotta et al. (1997), Islam et al. (2001), Shanley and Luz (2003), Mishra et al. (2004), Vellend (2004), Taverna et al. (2005), Harrelson and Matlack (2006), Liira et al. (2007), Gilliam (2007), Barbier et al. (2008), D'Amato et al. (2008), and D'Amato (2009). These investigations have shown that changes in forest structure are mainly attributable to differences in the overstory, which are leading in the loss of understory MAPs. These researches have also shown a link between medicinal plant development and forest type, such as old growth, degraded, and re-growth forests.

Studies in the Indian Himalaya have identified variables that contribute to the extinction of indigenous species (diversity, nativity, distribution pattern and habitat specificity). Pangtey and Samant (1988), Dhar and Samant (1993), Samant and Dhar (1997), Samant et al. (1998), Samant and Palni (2000), Arya (2002), Kohli et al. (2004), Batish et al. (2004), Samant and Pant (2006), Lal (2007), Samant et al. (2007a and 2007b), Chawla et al. (2007), Samant and Pant (2006), Sam (2008). The majority of these research focused on the fast population loss of native and endemic species as a result of strong human stresses.

There have been a few researches that used ordination techniques to create models to explain the impact of environmental factors on plants. Gauch et al. (1974), Hobbs and Grace (1981), Ter Braak (1986, 1987), Magurran (1988), Kent and Coker (1992), Kent (1996), Kashian et al. (2003), Ardakani (2004), Eshaghi et al. (2009), and Ali et al. (2009) are examples of these research (2015). Whittaker and Niering (1965), Currie and Paquin (1987), Rohde (1992), Stevens (1992), Rosenzweig (1995), Grytnes and Vetaas (2002), Panthi et al. (2007), Wazir (2008), Ahmad et al. (2011), Khan et al. (2013), and Ali et al. (2013) are some of the other researchers that have used a similar method (2014). A multivariate study of species was carried out utilizing ordination techniques such as CCA and DCA to understand the floristic structure

and impact of environmental factors on plants in the Hindu Kush Mountains of Pakistan. Different relationships and interactions between tree-tree, tree-herbs, and plant-environmental factors were shown in the research (Ali et al., 2015).

Harvesting and trading of MAPs

Many MAPs are commercially important because of their home use, as mentioned above. The whole system is assessed from the extraction of MAPs to the consuming end, and it is based on MAP availability and demand. With the passage of time, the demand for MAPs has grown across the globe, prompting individuals to seek out detailed information on these highly valuable commodities (Belcher and Ruiz-Perez 2005; Rasul et al., 2008). The growing commercial trade in natural goods has had an impact on wild population harvesting (Lange, 1998). The overexploitation of the natural population has resulted from the high-volume harvesting (Olsen, 2005b). In India, almost all of the 400 plant species needed in the herbal business are collected in the wild (Uniyal et al., 2000).

Trading of MAPs

The increasing indistinct trading behavior is another significant element driving the loss of MAP diversity. In the herbal industrial sector, a significant number of MAPs have been identified as high-volume trading species (Olsen and Larsen, 2003; Olsen, 2005b). With the rise in demand for MAPs products, species are being harvested at a rapid and unscientific pace (Kala, 2005b). One of the major reasons of biodiversity loss is the preference for wild species. In recent years, haphazard harvesting and overexploitation to satisfy demand has also slowed the illicit trade activity.

Every year, more than 400,000 tons of MAPs from roughly 3,000 species are trafficked on the worldwide market, according to TRAFFIC. A new International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSCMAP) was proposed to balance the needs of rural populations whose traditions and livelihoods rely on these species, and the six principles under this standard are: maintaining wild resources, preventing negative environmental impacts, respecting customary rights (for example, of indigenous peoples), and so on (Dooley, 2008). Ved and Goraya calculated the amount of demand and supply of medicinal and aromatic plants in India (2008b). According to the results, a total of 960 medicinal plants are documented for commerce, with 178 species used in large quantities (more

than 100 MT per year). To satisfy their growing demand, it has been proposed that these 178 species be domesticated on a wide scale.

As a major supplier of MAPs, the Himachal Pradesh government has designated the Pardhans of the Gram Panchayats to issue permits or passes for the transportation of minor forest produce collected from the forest or grown domestically in the concerned Panchayats under the Himachal Pradesh Forest Produce Transit (Land Routes) (Amendment) Rules, 2000. The price for an export permission is charged on 51 species that make up the maximum number of MAPs. The rural population's livelihood is dependent on these MAPs market value chains (GOHP, SFR, 2013).

Bajaj (1997) investigated the economic and livelihood impact of medicinal plants in Himachal Pradesh's Mandi and Kullu forest circles. Nandi (1999) investigated the entire market structure of Himachal medicinal plants, as well as the possibilities for employment in the state's medicinal plant sector. He concentrated on trade routes, regional and state-level networks, processing, pricing structure, and the amount of medicinal plants sold in Himachal Pradesh, as well as their conservation.

To investigate the Himalayan medicinal plant trade, Smith and Bhattarai (2005) established a broad categorization of different economic actors. According to Arya et al. (2012), consumers are more likely to purchase Ayurveda/herbal goods than those recommended by doctors, demonstrating the impact of the ayurvedic medical system on the population. They pointed out that learning about scientific information is useless unless it is passed on to resource users in order for the herbal business to develop in the worldwide market. MAPs like Picrorhiza kurroa, Podophyllum hexandrum, Nardostachys grandiflora, Dactylorhiza hatagirea, Aconitum heterophyllum, and Saussurea costus are also in great demand by the pharmaceutical sector (Uniyal et al., 2002).

Sharma and Kala (2016) investigated the Rhododendron arboreum (Brash phool) supply chain, as well as its variety and use value, throughout the Dhauladhar mountain range. The usage of R. arboreum flowers as medicinal, food supplements, and cultural purposes was emphasized in the research, whereas R. campanulatum was mainly utilized by transient residents for fuel wood or to build animal shelters at high elevations. The research also included information on the export value of flowers as well as the market supply chain.

Conservation and management of MAPs

Thousands of indigenous people live in the Himalayan area, and they have long used medicinal herbs in traditional health care. Many medicinal plants are utilized for subsistence by local people, and their protection is one of the most important methods of MAPs management (Jha, 1995; Gera et al., 2003). According to Oliveira (2007), the cultural and biological themes were used to assess the local conservation and harvesting sustainability of medicinal plants. They provided a technique for determining conservation priority based on species and geographic location.

Mountain research has set a precedent, and studies have documented the condition of medicinal and aromatic plants at the higher elevations. Ghimire et al. (2004) described the involvement of locals in the sustainable harvesting of species in the Nepal Himalayas in terms of ecological, biological, socio-cultural, and economic factors.

Chauhan (1989) examined the medicinal plant resources' potential and identified 20 medicinal plant species as endangered in the state. Based on his extensive research, he compiled a paper titled "Medicinal and Aromatic Plants of Himachal Pradesh," which is very useful for both researchers and the pharmaceutical industry. Kala (2005b) recommended the creation of medicinal plant conservation zones for the preservation of endangered medicinal plants in Himachal Pradesh's cold desert regions, as well as the importance of population studies of medicinal plants, based on years of research.

Oladele et al. (2011) investigated the role of Traditional Medicinal Practitioners (TMP) in MAP conservation and discovered that they had extensive knowledge of medicinal herb conservation. According to the research, TMPs utilize grown plants and spend a significant amount of money to get them, indicating that these MAPs have a substantial commercial potential. Cultivation of MAPs is therefore an essential strategy for the conservation of wild species as well as the creation of financial empowerment and job possibilities for rural people, resulting in an improvement in their socio-economic condition (Sher et al, 2010).

Traditional knowledge has the potential to contribute to global transformation and conservation (Berkes, et al. 2000). Conservation techniques include species preservation and management, as well as the identification of certain social systems in the framework of the scared grooves and rules. MAP knowledge has been lost among many tribes, although many indigenous people

have been able to preserve MAPs while adjusting to the changes that have occurred through time (Gadgil et al. 1993; Kala, 2005c).

Recognizing people's reliance on forest-based resources, the International Centre for Integrated Mountain Development (ICIMOD) has undertaken a number of projects to improve the livelihood options of the rural poor in the Himalayan region through the sustainable use and management of locally available and commercially valuable natural resources, including medicinal plants (Rasul et al., 2012). MAPs may enhance rural livelihoods via sustainable harvesting methods and well-established market accessibility, according to many research (Belcher and Ruiz-Perez 2005; Rasul et al. 2008).

Based on field research conducted in China and other Asian countries, Pie et al. (2009) investigated different ethnobotanical markers of sustainable usage for forest management. A framework comprising quantitative and qualitative indicators, such as indigenous forest-based knowledge, commercial use of wild plants, local usage, plant variety, and the involvement of local people in forest management decision-making, was developed in the research. They proposed the creation of a legal framework to safeguard the rights of traditional knowledge, which may aid in the sustainable use and management of forests, based on the assessment of these factors.

Indigenous traditions are becoming recognized as a useful instrument for environmental conservation and management, according to Kala and Silori (2013). In the Himalayas, inventorying and monitoring the varied flora is a huge job in and of itself. The area's national and local conservation and sustainable use capabilities are inadequate. Given these limitations, establishing priorities and assigning conservation values at the local and national levels will have a significant impact on conservation plans and will aid in their strengthening (Daniels et al., 1991; Kala et al., 2006).

With the passage of time, a link has been established between the harvesting and conservation of MAPs among various communities. Because of the overexploitation of MAPs, local people in certain areas of the globe have developed an interest in promoting MAPs harvesting as a conservation and development approach. Cultivation of MAPs is also a vital step for wild species conservation, and it will almost definitely result in financial empowerment and job possibilities, improving the socio-economic condition of rural communities (Maikhuri et al., 2001; Schippmann et al., 2002; Sher et al, 2010).

Harvesting practices

The extraction techniques previously established by various groups were examined to better understand the harvesting pattern. Historically, MAPs were gathered in tiny quantities by traditional healers for the aim of treating sickness and disease, or by local people for household purposes (Rai and Sharma, 1994). Local people living in woods and forest edges were well-versed in the gathering abilities of MAPs. They used to gather and preserve some of the most significant medicinal plants as a daily need or to treat illnesses.

The method of selective harvesting made it easier to gather raw materials from the wild. They used to gather plant components in particular according to a fixed schedule. Many studies have identified specific collection periods for MAPs, such as collecting young leaves in the spring, flowers and adult leaves in the summer, and fruits, seeds, and rhizomes in the fall. Plants were usually collected early in the morning or during the full moon (Samal et al., 2004).

Plant parts were gathered by Hakims in Pakistan from the surrounding forest region depending on the need for plant components (Khan et al., 2013). Tibetan healers in Tibet and Nepal, known as Amchi, used to conduct particular rituals before collecting plant parts (Lama, 2003). The religious calendar was used to compile the MAPs. According to them, the 7-day period (late September or early October) in the tahangsung rikhi (harvesting calendar) was when most medicinal plants in the alpine area finished their life cycle (Aumeeruddy- Thomas and Lama, 2004), which aided in the richness of medicinal herbs.

Ghimire et al. (2005) investigated the various harvesting methods used by Nepalese people for two endangered Himalayan medicinal plant species, Nardostachys grandiflora and Neopicrorhiza scrophulariiflora. The research looked at the impact of various harvesting patterns used by amchis and merchants on population dynamics. The harvesting technique was discovered by examining different practitioners from various locations. In addition, the practical setup of planting as a viable method for the herb's long-term sustainability was recommended.

However, the collecting of MAPs from the wild has become widespread and indiscriminate over time. Untrained individuals are hired by merchants to gather highly trafficked species. They are unfamiliar with sustainable collecting methods; therefore, their collection approach is highly damaging. They are compensated according to the amount of raw material they gather.

According to Olsen (1998), they gather raw materials and sell them to local merchants with the primary goal of "high volume and least value." Local people are sometimes joined by industrial employees while collecting raw materials in certain areas (Smith and Bhattarai, 2005). Species that were formerly plentiful are now threatened.

Research question

How does Conservation and Cultivation of Medicinal and Aromatic Plants impact on Health and Socio-Economic status of General Farmers of Pithoragarh District of Uttarakhand?

Objective

1. To study the conservation and management issues related to medicinal and aromatic plants and to set priorities for their long-term conservation.
2. To document the ethnobotanical knowledge of medicinal and aromatic plants used by local people.

Methodology

- To document the knowledge about MAPs across the study area following methodology was adopted:

• **Sampling design:** This is a subjective and quantitative investigation. In this investigation, there is spellbinding examination is intended for assortment of the data.

• **Study area**: Pithoragarh, Uttarakhand

• **Duration of study**: 3 months

• **Primary data:** The essential information will be taken by directing family overview, center gathering conversation, local gathering and individual meeting.

• **Secondary data:** The secondary data will be collected from books, journals, and government statistics reports.

• **Design of the questionnaire:** The questionnaire will be designed to collect the data to keep in view the objective of the study. It will be semi-structured, mostly closed ended and open- ended short questions.

• **Sampling techniques:** In the first stage, Multistage sampling will be used in selection of villages in a block. After that systematic sampling will be used to selection of household and family who is involved in MAP Cultivation activities through General Farmers.

Literature survey

The extraction techniques established by various groups were examined in order to better understand the harvesting pattern. MAPs were traditionally gathered in tiny quantities by traditional healers for the aim of treating sickness and disease, or by local people for household purposes (Rai and Sharma, 1994). The gathering abilities of MAPs were widely known among the local people living in woods and forest edges. They used to gather and preserve some of the most significant medical plants as a daily need or for the treatment of illnesses.

The gathering of raw material from the wild was made easier thanks to the selective harvesting method. They used to gather plant components in particular according to a predetermined schedule. Many studies have identified specific collecting periods for MAPs, such as harvesting young leaves in the spring, flowers and adult leaves in the summer, and fruits, seeds, and rhizomes in the fall. Plants were usually collected early in the morning or during full moon (Samal et al., 2004).

Plant pieces were gathered by Hakims in Pakistan from neighboring forest areas depending on the need for plant components (Khan et al., 2013). Tibetan healers from Tibet and Nepal, known as Amchi, used to conduct rituals before collecting plant parts (Lama, 2003). The religious calendar was used to compile the list of MAPs. According to them, the 7-day period (late September or early October) in the tahangsung rikhi (harvesting calendar) was when most medicinal plants in the alpine area finished their life cycle (Aumeeruddy- Thomas and Lama, 2004), which aided in medicinal herb enrichment.

Ghimire et al. (2005) investigated several harvesting methods used by Nepalese people for two endangered Himalayan medicinal plant species, Nardostachys grandiflora and Neopicrorhiza scrophulariiflora. The research looked at the impact of various harvesting patterns used by amchis and merchants on population dynamics. The harvesting technique was discovered by taking into account different practitioners from various areas. Additionally, the practical setup of planting as a viable method for the herb's long-term sustainability was recommended.

However, MAP collecting from the wild has become widespread and indiscriminate over time. For the gathering of highly trafficked species, merchants employ unskilled individuals. They don't know how to gather in a sustainable way; therefore, their approach is very damaging. They are compensated based on the amount of raw material collected. According to Olsen (1998), they gather raw materials and sell them to local merchants with the primary goal of "big volume and lowest value." For the gathering of raw materials, local people are sometimes joined by industrial employees (Smith and Bhattarai, 2005). Species that were formerly common are now threatened.

Data analysis plan:

The collected data will be analysed through different statistical tool like Excel and SPSS. Different variables will be used to know correlation between them.

Ethical consideration:

The community or participants will be given informed consent.

Implications of research: The data collected will be helpful to analyse their present situation of financial inclusion and impact on livelihood. This will be led to improvement in current practices to enhance their income and way of living.

Limitation of Study

- The prices referred in paper are with reference to the prices of Tanakpur Mandi, although the production data is of various districts of the state.
- Based on survey, it was found that prices remain almost stable in terms of different years for MAP products, so in this paper price reference is taken as of year 2014 to 2015.
- The prices considered are from Tanakpur mandi only.

- Production is the estimated production, as some crops have fertility period of 1to 3 years.

Conclusion

The demand for therapeutic plants is growing at an exponential rate, depleting naturally existing supplies. As a result, it is critical to concentrate on medicinal plant conservation in order to compensate for the loss of wild plant diversity while also meeting the demand for medical plants. Various conservation methods, as described above, may help to start and support medicinal plant conservation management and preservation for human healthcare requirements. The greatest way to conserve plant populations is to ensure that they continue to develop and evolve in the wild, in their native environments.

With its diverse altitudes, deep glacier and river valleys, heavy rainfall regions, and high desert areas, the Himalayas are a rich source of biodiversity and endemism. Many tribal regions still use traditional herbal treatment, and many therapeutic plants and essential oils have shown amazing biological activity. Unfortunately, there is still a scarcity of data linking essential oil biological activity to ethnobotanical applications of plants. This may be attributed to activity in non-volatile components in many instances. Furthermore, many phytochemical researchers have overlooked bioactivity testing for ethnopharmacological applications. As a result, much more research can be done to discover phytochemicals linked to biological processes that support traditional medicinal plant applications. A few sweet-smelling plants have additionally shown financial potential as seasoning specialists, fragrances, beautifiers, and insect sprays. Impractical collecting, partially because of popularity for fundamental oils, home grown cures, and drugs, is undermining Himalayan restorative plants [474], and developing ecological debasement, obtrusive plant species, and environmental change are altogether compromising Himalayan local vegetation. We support the preservation of traditional Himalayan medicinal plant knowledge and applications, and we hope that further measures be made to conserve and preserve the Himalayan ecosystem.

Recommendation Cultivation Program:

The MAP cultivation programs providing the great opportunity to farmers and unemployed youth to get employment at their own places. These crops can be produced in very high altitude and those parts also where it is difficult to grow traditional crops. The environment of Uttrakhand is very supportive to the growth of these MAP. So many illiterate women and villagers are now earning good amount of money by growing MAP products under cultivation programs. There are various schemes started by Uttarakhand government like Jari Buti Yojana, National mission on Medicinal Plants , Aawala Mission in Uttarakhand, tribal sub-plan projects etc focuses on increase the cultivation of Medicinal and Aromatic Plants in districts , registration of MAP cultivators/farmers ,quality planting material production in departmental nurseries ,subsidy distribution to MAP growers, establishment of distillation unit for aromatic crop ,training to MAP cultivators/ farmers etc are in main focus. Although the cultivation program is going in the right direction but there are so many areas under which there is a huge scope of improvement. These areas are quality, packaging, marketing and promotion. In Uttrakhand the marketing and promotion part of MAP needs a lot of improvement.

Supply Chain Management: Government of Uttrakhand state has established a formal supply chain of MAP products which include procurement and distribution of products through various government agencies which act as intermediaries like BHESAJ Corporation, KMVN and GMVN. But due to some short comings in the chain, very less quantity of total cultivated products is going through this chain. The prime reason for this is, the price paid by industry for MAP products directly to MAP cultivators or unofficial inter-mediatory or agents is very high, in comparison to the price that cultivators get after selling through government nodal agencies. Farmers are also supportive of the system of direct selling to agents and industries as they earn quick and thick amount of money by this. But due to this government exchequers face big loss of money, which could have been earned in the form of royalties from these crops. Another indirect loss of this is, the official data available to government of production quantity, cultivation pattern of different crops is not realistic and appropriate. Due to this, various government schemes implemented for improvement of MAP product cultivators are not very effective. So, in order to improve the overall

system and supply chain of MAP products, following suggestions are presented as a conclusion of this study:

- During study it was observed, that although the Bhesag Corporation, KMVM and GMVN have three different roles as direct collector, Bandhak and commission agent, but in most of the district these organizations are focusing only on the third role i.e. Commission agent role.
- Under this role the activities of these organisations get limited and they focus primarily on the auction activity. This is relatively an easier role, as major action in this is arranging auctions at different designated places and collecting the royalty from auctioned items, based on their selling prices. In this case, the farmer is responsible for processing of the product, arranging warehouse, transportation and taking related risks. Whereas Bhesaj, KMVN or GMVN concentrate on Auction part.
- In order to get the better results from auction, in terms of better supply chain management and better pricing, instead of various stakeholders it can be a good option to have one integrating organisation.
- The number of collections centre from all the three organisations are limited, and normally less than 100, but considering the tough and varying geographical locations in the state, these centres need to be increased, so that all farmers can have an easy access to them.
- Cultivators do not know the final destination of their crops and price in domestic and international markets. The Government can arrange a MIS (Management Information system) under Bhesag corporations from where the farmers can take the information about the price and demand of different crops. This will help farmers to cultivate the crop which will be high in demand in coming year. The government can also start a call centre which can give information to cultivator about the market price and market demand for various crops.
- Auction pricing can be made dynamic and can be related to the current market demands. This will yield high income for cultivators and better earnings for governments. Price control shall be done by government based on demand and supply of different crops.
- To promote the herbs and aromatic plants cultivation and sale in state, Uttarakhand government can promote the Herbal tourism in the state. It includes government certified herbal sales counters; PPP model based Herbal spas, herbal treatment, herbal

massage parlours etc. This will help in further employment generation in state directly and indirectly.

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