Proceedings of Launch Workshop of DST funded Project "Studies on Improving Livelihood Generation through Scientific Interventions in *Pinus Gerardiana* Wall. and Important Wild Mushrooms in Himachal Pradesh"

Venue: Hotel Holiday Home, Shimla Date: 23rd June, 2018

A Launch workshop of DST funded project "Studies on **Improving** Livelihood Generation through Scientific **Interventions** in **Pinus** Gerardiana Wall. and Important Wild Mushrooms in Himachal Pradesh" was organized by Himachal Pradesh State Council for Science, Technology Environment (HIMCOSTE) in



collaboration with Himalayan Forest Research Institute (HFRI), and H.P. Forest Department (HPFD), Shimla at Hotel Holiday Home, Shimla on 23rd June, 2018. More than 100 delegates including scientists, academicians, forest officers, NGO's, representatives of Panchayati Raj Institutions and officers of different departments of Himachal Pradesh participated in the workshop. The objective of the Launch workshop was to generate awareness among the Stakeholders and to promote interaction between different stakeholders and concerned authorities on Chilgoza pine and important wild mushrooms of Himachal Pradesh.



In the beginning of the inaugural session, Sh. **Kunal Satyarthi,** IFS, Member Secretary, HIMCOSTE, welcomed the Chief Guest Sh. Tarun Kapoor, IAS, Chairperson HIMCOSTE-cum-Addl. Chief Secretary (Environment, Science & Technology) Govt. of Himachal Pradesh. He also welcomed Guest of Honour, Sh.

Ajay Kumar, IFS, PCCF (Finance) Himachal Pradesh Forest Department,

Special Guest, Dr. V.P. Tewari, Director, HFRI, Shimla and all the distinguished delegates participating in the workshop. He gave a overview of the project; the objectives and the purposed methodology. He requested the delegates to give suggestions on how to proceed in next three years of project period for successful implementation of the project. He said that there is a proposal to make Chilgoza a "Theme Tree" of the Kinnaur district and it would be mandatory to plant Chilgoza pine tree at all Govt. offices in Kinnaur. He also said that all the knowledge available with UHF, Nauni and other institutes in HP have to be taken into account and then research gaps should be identified and prioritized in the project. He said that project would be assessed critically by the respective experts of each component and requested them to give suggestions for improvement of the project. He concluded by saying that steps are also being taken to register Chilgoza as a Geographical Indication for district Kinnaur.



Sh. Ajay Kumar, PCCF (Finance) Himachal Pradesh Forest Department expressed happiness over being part of this project. He said that Chilgoza pine is an important high level conifer tree of inner high range of Himalaya's and is popularly known for its edible nuts locally known as Neoza. It is a very

important non-wood product and an important cash crop of the people of Kinnaur district. Local people harvest nuts every year from the forest, sell them in the market and earn money for sustaining their livelihood. Further, he said that, regeneration of Chilgoza Pine was quite low due to severe biotic and abiotic pressure and one of the major reason was wrong harvesting methods followed by local communities for extraction of Chilgoza cones. He further added that wild mushrooms are also very important non-wood forest product. Many of them are edible, some are poisonous and some other have medicinal value. People who are collecting and selling them do not have much of scientific knowledge regarding availability, harvesting, cultivation and preservation techniques. The objectives of this project are well defined and are very much linked with the policy of the State Government. On behalf of HP Forest Department, he assured that the department would provide all the necessary support required for the successful implementation of the project.

Dr. V.P. Tewari, Director, Himalayan Forest Research Institute (HFRI), Shimla welcomed all the dignitaries, present in the workshop. He said that the HFRI is implementing this project with HIMCOSTE with support from the Himachal Pradesh Forest department. He said that Chilgoza pine is mainly found in



inner dry temperate areas in Pangi, Bharmour, and Kinnaur region of Himachal Pradesh and is listed under near threatened category as per IUCN. Its regeneration is very low, population is depleting and it might become extinct species in near future. He deliberated on the viability of seeds and rancidity. He said that HFRI is working upon current harvesting practices and providing the technical information to local people whose livelihood depends upon Chilgoza. He said that there are more than 33 genera of wild mushrooms. Out of them, only *Morchella esculenta* (Guchhi) is being collected and dried by the local people for selling in the market and rest of the wild mushrooms are fleshy with low shelf life. He said that there is a lack of integration of formal and informal knowledge especially traditional knowledge available with the people living in the vicinity of forest areas. He stressed upon the fact that the local people have lot of scientific knowledge and technical information and therefore, it is necessary to integrate it otherwise we will lose our traditional knowledge.



Sh. Tarun Kapoor, IAS, Chairperson, HIMCOSTE-cum-Addl. Chief Secretary (Environment, Science & Technology), Govt. of Himachal Pradesh the Chief Guest, said that the subject of this project was very interesting, because it involved studies on improving livelihood generation through scientific

interventions in Chilgoza Pine and important wild mushrooms. During the course of workshop all suggestions must be focused around improving the marketability of the produce, so that livelihood of the local people can be improved. Speaking about the mushrooms he said that no one knew as to how many different varieties of mushrooms grow in Himachal Pradesh. If we identified and improved the production of some of these species, it could be the



source for increasing livelihood of the people. He said that *Pinus gerardiana* needed special attention as we did not have exact status of Chilgoza Pine in Himachal Pradesh and whether its production is increasing or decreasing and if there is there any impact due to climate change. He further said that we

should look forward to real research taking place in the field rather than just simple discussion.

TECHNICAL SESSION -1:

Sh. Kunal Satyarthi, IFS, Nodal officer of DST funded project made a brief presentation on overview of the project. He presented the background and objectives of the project and updated the audience on progress made till-date. He said that a questionnaire had been prepared by the HFRI for filling up the



observations during the field work. The Slope, Aspect and Soil maps of Kinnaur district have been prepared by HIMCOSTE team. Tentative estimate for repairs and renovation of Guard Quarter to be used as Temporary Research Station at Reckong Peo has been received. Out of total amount, 70% of the amount has already been released and remaining 30% will be released after the completion of work. A tripartite MOU accordingly is being signed between HIMCOSTE, HFRI and HPFD. He also talked about area under Chilgoza in Kinnaur district and Chamba district. He discussed the methodology of mapping and physical targets to be achieved in the project in the year 2018-2019.

The distinguished delegates of the workshop made following suggestions:

• Forest density mapping by Forest Survey of India is good to be compared with but it is good to go for 10 classes for forest type mapping initially which would be non-biased and then it can merged into desired number of classes. Satellite data i.e. LISS-III, LISS-IV and Quick Bird satellite images should be used for forest mapping.



• The Chilgoza working circle is not too big and 5x5km grid is only for synoptic view or bird eye view. Total enumeration and ratio tracking could be undertaken if specific species are to be targeted. This would give better idea of what is the current scenario with the population of Chilgoza tree.

- If total enumeration is not possible, then 1kmx1km intensive field survey can be done counting and geo-tagging every single tree.
- Within the 5x5km grid random sampling can be done and within that cluster sampling could be done. It would cover all the micro-climatic conditions in that area and hence much better results can be obtained.
- Soil map available is not sufficient for activity we are attempting so more intensive survey is required.
- Niche of the Chilgoza should be taken care of. Plantation of Chilgoza outside its niche is not desirable.
- Geology of study area is unique, so geology map should be considered. These maps are readily available with Geological Survey of India and 1:50,000 scale maps can be used if it is available.
- Chilgoza is important to Himalayan people particularly for Kinnaur district. However, they are not much dependent on Chilgoza for their livelihood now a days and social customs are also gradually changing. But, its ecological aspect is more relevant and this should also be taken into consideration.



• As livelihood generation is the main concern under this project, work should be carried out in collaboration with Rural Development Department. Project schemes like MNREGA, National and Rural Livelihood Mission, other State project schemes like Mukhyamantri Yuva Rojgar, Mukhyamantri Aajeevika Yojna, etc. can be used for livelihood support in collaboration with Deputy Commissioner of Kinnaur district.



- Base line data for the study of the Chilgoza should be taken into consideration.
- Habitat of the Chilgoza tree should be taken care because this species is very sensitive due to lack of associated species. While planting Chilgoza trees, local species of other

related trees should also be taken into consideration.

• This species is not much dispersed by the air as it doesn't have winged seed like other conifers. Mostly it is dispersed by the birds, viz., Nut Cracker. Therefore, conservation of these species of birds is also very important in the study area.

Dr. Ashwani Tapwal, Scientist-E, Principal Investigator of the Mushroom Component of the project, presentation on background, status and objectives of the mushroom component. He detailed presentation gave on methodology related to ethno-mycological identification, taxonomical study, phytochemical biochemical analysis,



analysis and antioxidant and antimicrobial activity, fungal germplasm conservation, DNA fingerprinting, value addition, sensitization trainings and ethno-mycological documentation and progress achieved till date. The project action plan was discussed in detail.

Following recommendations were made by the eminent expert members:

- The selection of study area is good, it may be divided into zones and stratified sampling should be followed.
- Standard field keys and taxonomic keys may be followed for the identification of mushrooms.
- Macroscopic characters of the fresh mushroom specimens should be recorded in the field.

- Culture of mushroom species should be raised and submitted to national culture banks.
- Molecular characterization, nutritional/ biochemical analysis should be done for important species.
- The species which have high economic value should be taken into consideration for bioactive molecules.



- Solar drying techniques for mushroom preservations should be encouraged.
- Local people should be trained about mushroom collection and conservation techniques.



Sh. Pitamber Singh Negi, Principal Investigator of Chilgoza Component of the project made detailed presentation on distribution of Chilgoza Pine in India, uses, threats to Chilgoza pine, past work done on Chilgoza pine in India and objectives of Chilgoza component in the project. He also presented before the

distinguished delegates about the methodology being adopted to carry study on harvesting methods, seed maturity indices studies, seed viability-cum-longevity studies, seed source variability, density assessment studies of Chilgoza Pine and status of progress achieved so far.

Following suggestions were made for Chilgoza Component of the project:

- Mycorrhiza in association with *Pinus gerardiana* planting should take into consideration for raising planting stock.
- Associated species related to *Pinus gerardiana* should also be taken in to consideration during the field study.
- Drying period and extraction of Chilgoza nuts is long process by using traditional harvesting method so technology should be designed to reduce both time period and make extraction of nuts easier.

• Shelf life of any material depends on the packing material. So best packaging material for Chilgoza seeds should be found out.

TECHNICAL SESSION-II: Panel Discussion on Mushroom Component:

Panel discussion on Mushroom component was chaired by Prof. T.N. Lakhanpal, (Retd.) Himachal Pradesh University, Shimla and co-chaired by Dr. N.S. Attri, Professor, Department of Botany, Punjabi University, Patiala.



DDr. N. S. K. Harsh, Scientist-G (Retd.), FRI, Dehradun, made a presentation on "Fungal Diversity in North-West Himalaya: Challenges and issues". He said that cost of 1 Kg. of *Morchella spp.* is US \$ 216 for exporter and US \$ 330 for the importer. In Himachal Pradesh and Jammu & Kashmir morels are collected

systematically during the growing seasons (spring and sometimes after rainy season) and sold to established markets both fresh and as dried mushrooms. He informed the house that fungi in forest ecosystem act as the decomposers, symbionts and pathogens and constitute an interesting group of organisms, which depend largely for their survival and growth on climatic factors like moisture, temperature and nutrients. A vast majority of fungi are microscopic, living in the soil, litter, water and in close association with plants, animals and other organisms. He was of the opinion that fungi are facing threats to their existence due to loss of habitat and hosts, over exploitation, climate change, developmental activities, pollution, etc. He also enlightened the house about the biodiversity of mushrooms in NW Himalayan region. He was of the opinion that to protect, conserve and restore the fungal diversity, a concentrated response from governments and society is required. Creating awareness about fungi and preparing next generation of mycologists would be crucial for this onerous and challenging task.

Dr. Maninder Jeet Kaur, Secretary cum Principal Scientist, Himalayan Research Group (HRG), Chotta Shimla, made presentation on "Button Mushroom Cultivation - Livelihood Development Option for People in Mountains". She deliberated on the cultivation of Button Mushroom and Organisation of People and Technology Dissemination. She said



that two basic things required for cultivation are spawn preparation and compost preparation. She informed that HRG has been involved with button mushroom cultivation since past 15 to 17 years and has been distributing compost to the farmers in different parts of Himachal Pradesh. She also informed that involvement of people was very important and it required one to one meeting with farmers in selected areas, followed by awareness camps including Panchayat representatives, members of Mahila Mandals to popularize the cultivation technology. During technical trainings for the local communities, market linkages for procurement of raw material and selling of product are also one of the important components.



Dr. Y. P. Sharma, Professor, Department of Botany, University of Jammu (J&K) made presentation on "Wild edible Mushrooms of Jammu and Kashmir". He gave detailed account of wild mushrooms of Jammu & Kashmir and shared methods of documentation of ethnomycological information. He

informed that *Morchella* species are the most important and costly mushrooms of the region. He was of the opinion that mushrooms are the minor forest products, but serve as important component of forest ecosystem and links between plants and human beings. Mushrooms are playing important role in green economy of many countries. There is a need to explore and conserve their germplasm.

TECHNICAL SESSION-III: Panel Discussion on Chilgoza Component:

Panel discussion on Chilgoza Component was chaired by Prof. M. K. Seth, (Retd.) Department of Biosciences, Himachal Pradesh University, Shimla and co-chaired by Sh. S. P. Negi, IFS, Conservator of Forest, HFRI, Shimla.



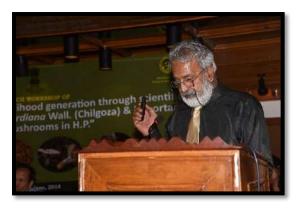
Somesh Associate Dr. Sharma, Professor, School of Bio-engineering and Food Technology, Shoolini made presentation University "Complete Drying and Dehydration technology for Chilgoza nuts". He gave detailed presentation on properties and uses of Chilgoza nuts, maturity and harvesting. cone collection

grading and drying, packaging, storing and marketing of the Chilgoza nuts.

Dr. Ombir Singh, Scientist-E, FRI, Dehradun made detailed presentation on "Recent Advances in Chilgoza (*Pinus gerardiana*). He talked about distribution, seed displacements, morphology, flowering and fruiting, silvicultural characters and natural and artificial regeneration. He said that



Chilgoza played important role in socio-economic up-liftment of people in tribal areas. It is excellent soil binder and capable to grow on excessively dry, barren hillsides with shallow soil. He said that regeneration is very poor and species is facing high risk of extinction and suitable strategy and action plan should be devised. Mycorrizal inoculation of seedlings in the nursery through forest soil should be undertaken for raising nursery stock. He said that lopping should be done carefully during cone collection as the previous year branches containing fruiting bodies should be conserved for next year crop. He said improvement of *P. gerardiana* should given top priority.



Dr. Rajan Bawa, Professor (Retd). Dr.YSP University of Horticulture & Forestry, Nauni, made a presentation on "Pinus gerardiana-lately discovered and quite early endangered: Reasons and Solutions" He gave information on the introduction, occurrence, current and future uses and natural and artificial

regeneration of *Pinus gerardiana*. Speaking about the habitat and distribution of *Pinus gerardiana* he told that it prefers rocky and dry regions outside the influence of monsoon in arid and completely snow sheltered areas. Apart from the morphological features of the plant, he highlighted the problems related to its natural regeneration. As all its cones are harvested by lopping long branches, its crown/ canopy is disturbed which skews its growth behavior. Elimination of one year old cones and terminal buds, injured sites on braches giving way to infection and leftover seeds being consumed by birds, rats, squirrels and insects all lead to very less natural regeneration of this species. Artificial regeneration through grafting, air-layering, homoplastic grafts and top bud cleft grafting has been tried in trials at Shilley, Skibba, Holdoo and Sharbo nurseries in Kinnaur with limited success. The seeds of *Pinus gerardiana* are not only used for commercial purpose, but also for traditional purpose. Seeds are steamed, cooled and deshelled for making garlands which are a status symbol in marriages, welcoming guests at social events, etc.

TECHNICAL SESSION-IV Session on Remote Sensing and GIS:

Panel discussion on Chilgoza Component was chaired by Sh. B. D. Suyal Regional Director Forest Survey of India, North Zone, and co-chaired by Sh. Kunal Satyarthi, Member Secretary, HIMCOSTE.

Dr. Sarnam Singh, Scientist-G made presentation on "Assessment and distribution of *Pinus gerardiana* and other Important Wild Mushrooms using Geospatial Technology". He said that mapping on 1:5K or 1:10K using high/ very high resolution multispectral,



hyper spectral satellite data should use (LISS IV, IKONOS, World View, and Sentinel etc.). He talked about Coverage/ Area density, site quality, soil etc of *Pinus gerardiana*. He spoke on the feasibility and prioritization of mushroom-potential and targeted species. He said that forest type wise, ecosystem wise, Community wise, occurrence and geo-tagging of mushrooms should done. He further said that characterization of habitat for target species using EO- ground data and climatic data in GIS domain should be taken into consideration.



Dr. Sunil Chandra, Deputy Director, (SM) FSI, Dehradun, made detailed presentation on "Multisource data classification using Non-Parametric approach for identification of *Pinus gerardiana*". He said that use of statistical classifiers such as MLC and minimum distance to mean classifier for forest classification should be adopted.

Generalization of forest classes should be taken into consideration. He said that spectral component of satellite data alone is usually insufficient to achieve reliable recognition of forest species. Thus, suitable ancillary information may be required to resolve the confusion in various forest types/species. He said that ancillary data can be used as layers in image analysis for forest classification. Higher accuracy could be achieved as compared to statistical classifiers. Incorporation of ancillary data may increase the size and complexity of dataset. Some parameters may have a significant affect in the study area, but some may affect accuracy due to their insignificance.

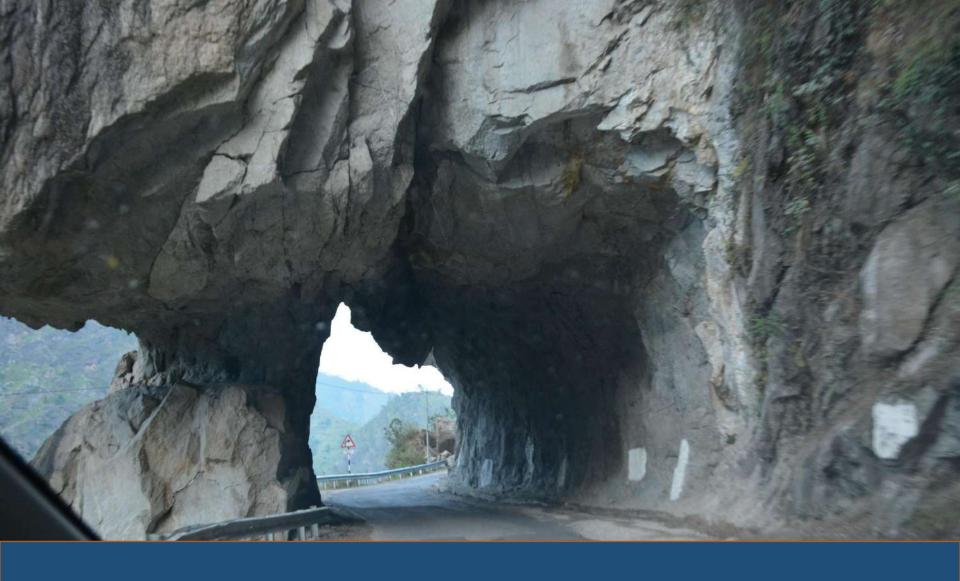
At the end, Sh. Kunal Satyarthi, IFS Member Secretary, HIMCOSTE thanked the Chief Guest, Sh. Tarun Kapoor, IAS Chairperson HIMCOSTE-cum-Addl. Chief Secretary (Environment, Science & Technology), Govt. of Himachal **PCCF** Pradesh; Sh. Ajay Kumar, (Finance) Himachal Pradesh Forest Department; Director, HFRI; Director,



Rural Development Department; Commandant ITBP; Chair, Co-chair persons

of the technical sessions, presenters, all administrators and forest department officers from Kinnaur, Bharmour and Pangi; members of press & electronic media and also all the participants of the workshop. He concluded the workshop by saying that academic deliberations during the day had brought forward many contributions which would be of immense help in implementation of project. He laid due emphasis on the importance of suggestions made by Chair, Co-chair, participants and ensured that both the teams would take valuable suggestions and scientific inputs into consideration.

Sh. Kunal Satyarthi Member Secretary, HIMCOSTE



Studies on Improving Livelihood Generation Through Scientific Interventions in *Pinus gerardiana* Wall. and Important Wild Mushrooms in Himachal Pradesh

IMPLEMENTING INSTITUTES

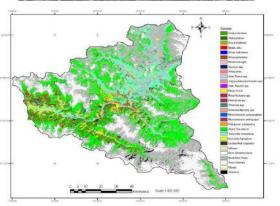
Himachal Pradesh Council for Science, Technology & Environment (HIMCOSTE)

Himalayan Forest Research Institute (HFRI)

In collaboration with H.P. Forest Department (HPFD)









Nodal Officer

Sh. Kunal Satyarthi, IFS Member Secretary,

Himachal Pradesh Council for Science, Technology & Environment, Shimla

Principal Investigators

Dr. Ashwani Tapwal, Scientist E

Sh. P. S. Negi, Scientist C

Himalayan Forest Research Institute, Shimla

Co-Principal Investigator

Dr. Aparna Sharma, Sr. Scientific Officer

Himachal Pradesh Council for Science, Technology & Environment, Shimla

Project Period: 3 Years (2017-18 to 2019-20)

Total Project Cost: Rs. 1,96, 43,602/-

HFRI: Rs. 1,26,08,486/-

HIMCOSTE: Rs. 70,35,116/-

LOCATION

In Himachal Pradesh, *Pinus gerardiana* is mainly distributed in Kinnaur district and small patches have also been recorded in Pangi and Bharmour subdivision of Chamba district.

Wild Mushroom component will also be primarily focused on these two areas but may be expanded to a larger geographical zone.

OBJECTIVES OF THE PROJECT

Pinus gerardiana Component:

- To study current harvesting practices and its impact on cone production.
- To determine maturity indices for seed collection and suitable storage conditions for enhancing seed longevity.
- To screen out best seed sources for raising quality planting stock.
- Mapping of *P. gerardiana* geographical area and best seed sources.
- Development of extension material for dissemination of technology to end users and awareness generation.

Wild Mushroom Component:

- Exploration, identification and conservation of wild edible, poisonous and Medicinally important mushrooms.
- Biochemical characterization of important wild mushrooms.
- Training of rural households on conservation and preservation of important Wild Mushroom.
- Geo-tagging of species wise location in the study area.

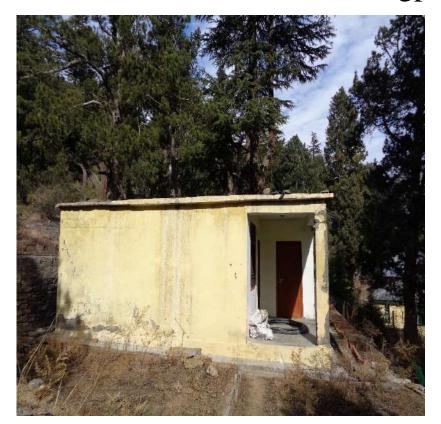
Progress till date:-

- Human Resource in place at HFRI & HIMCOSTE
- Equipment purchase & installation at HFRI
- Literature scan
- HIMCOSTE-HFRI meeting (4.1.2018 at HIMCOSTE)
- HPFD-HIMCOSTE-HFRI meeting (13.3.2018 at HPFD)
- HPFD-HIMCOSTE-HFRI meeting (29.3.2018 at HFRI)
- HIMCOSTE-HFRI meeting (30.05.2018 at HIMCOSTE)
- During the 1st year of project only Kinnaur District would be targeted. (Maybe Chamba too?)
- Field visits of Kinnaur undertaken.
- Initial samples collected

Progress till date:-

- Questionnaire prepared by the HFRI for filling up the observations (two parts).
- Working Plan analysis.
- Research papers on studies on spectral signatures in different plant species.
- Grid maps (5×5kms) of whole Kinnaur and Chamba District has been prepared.
- Slope, Aspect and Soil maps of Kinnaur districts has been prepared.
- Estimate for repairs and renovation of Guard Quarter to be used as Temporary Research Station has been received. 70% of the amount has already been released and remaining 30% will be released after the completion of work.

Proposed Temporary Research Station and Nursery Site at Recongpeo, Kinnaur.





- The MoU would be signed between HFRI, HPFD, HIMCOSTE.
- Estimate for repairs and renovation
- Making it functional at the earliest

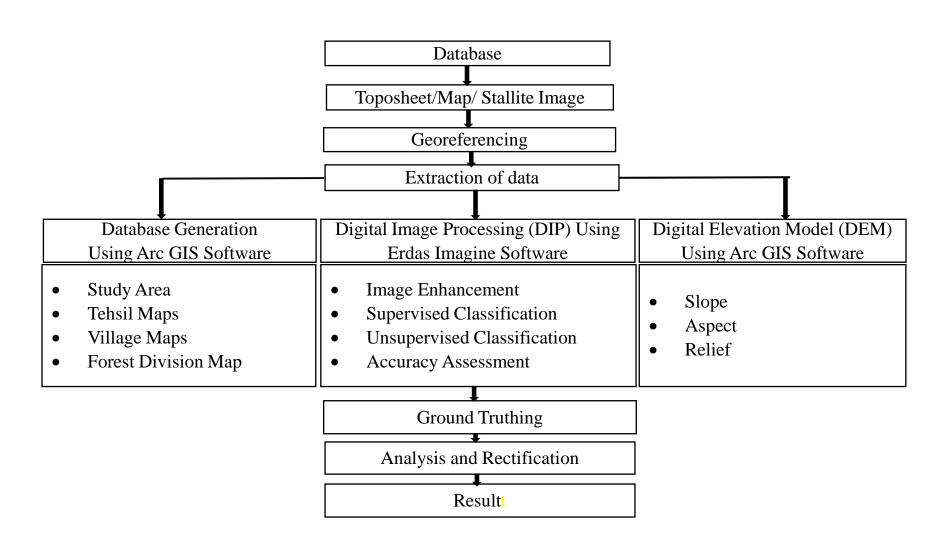
Date: 13th March, 2018 Place: Office chamber of PrCCF (HOFF)

- Density assessment of Chilgoza pine forest to be done on FSI pattern, during field visits.
- Local Value Addition & Marketing of Chilgoza
- Protocols should be standardized on the grading and packaging of Chigoza seeds.
- Seed maturity indices for chilgozapine seeds may be studied during its harvesting by native people across the altitudinal range.
- For nursery trials 'sunken' trench method may be followed as explained in the meeting by the Chairman.
- Germplasm conservation nursery/ arboretum of Chilgoza pine should be raised by collecting seeds from different sources.
- Mushroom cultures may also be deposited in the National Level Cultures Repository like NTCC FRI, Dehradun for permanent record and up keep.
- Effort would be made to develop Chilgoza outside natural Forests
- A Technical Group workshop followed by Launch workshop of all stakeholders

HPFD-HIMCOSTE-HFRI meeting (29.3.2018 at HFRI)

- Recommendations made for executing the project:
- HIMCOSTE Component
- Density assessment of Chilgoza pine forest may be done on FSI pattern during field visits i.e. <10%, 10-40%, 40-70% and >70%
- Weighted Overlay Analysis may be followed by superimposing grid map with slope, aspect, elevation and rainfall aspects as these all are important parameters.
- 5% sampling intensity for survey should be used during field survey for *Pinus gerardiana* and important Wild Mushrooms.
- HIMCOSTE should initiate steps to register Chilgoza as a Geographical Indicator (GI) of the State.

Mapping Methodology



Area in Kinnaur

The total area of chilgoza working circle is 2844.53Ha. The distribution by division and ranges is as under:

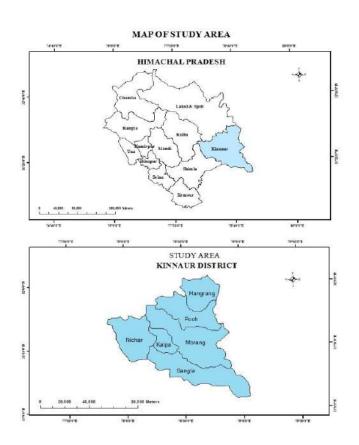
Nichar Forest Division	Area in Ha.	Pooh Forest Division	Area in Ha.
Kalpa Range	777.8	Morang Range	1435.83
		Pooh Range	630.9
Total	777.8		2066.73

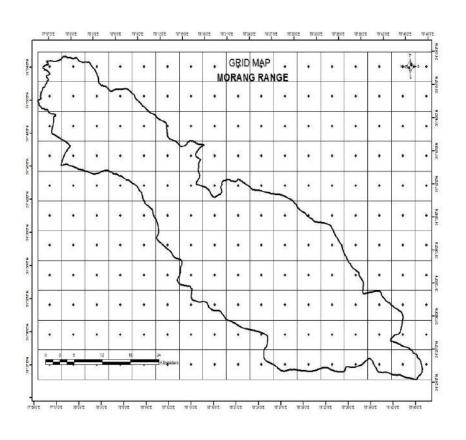
Kilba Range area?

Maps

Study Area Kinnaur District

Range Wise Grid Map Morang Range

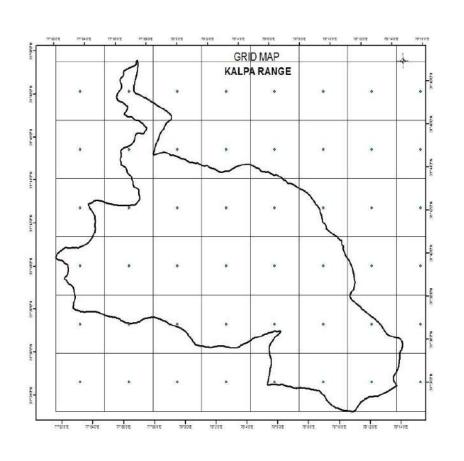


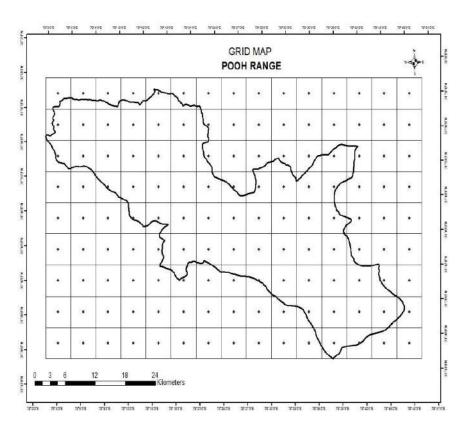


Range Wise Grid Map

Kalpa Range

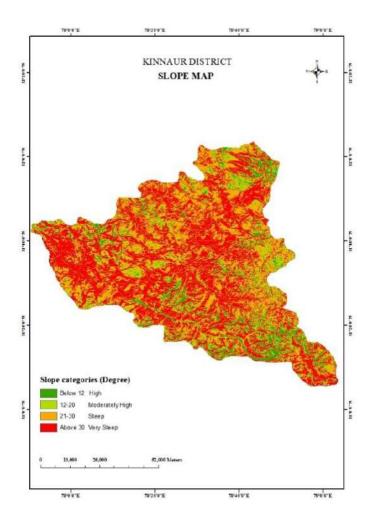
Pooh Range



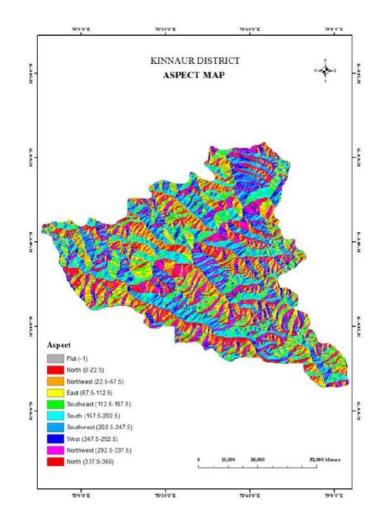


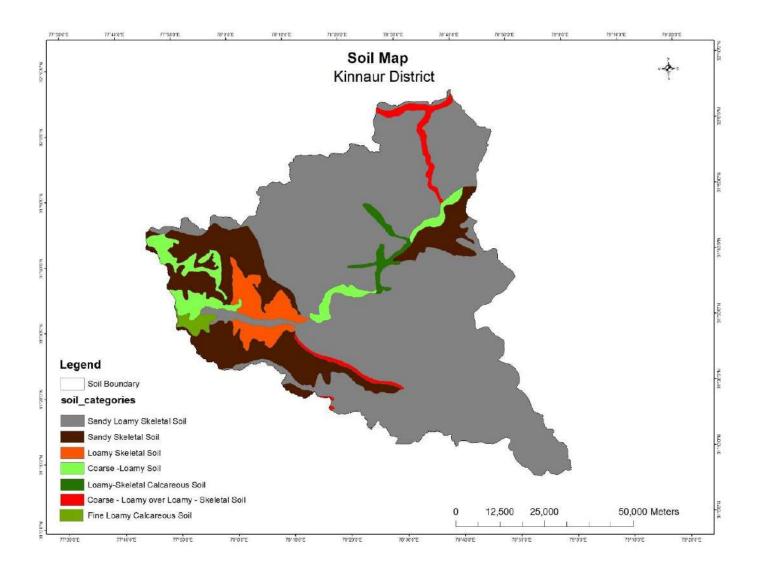
Maps

Slope Map of Kinnaur District

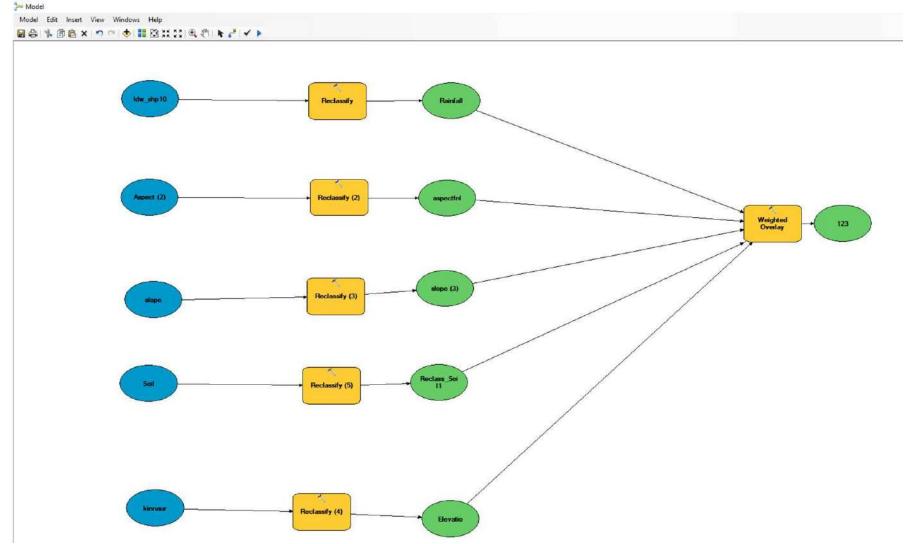


Aspect Map of Kinnaur District

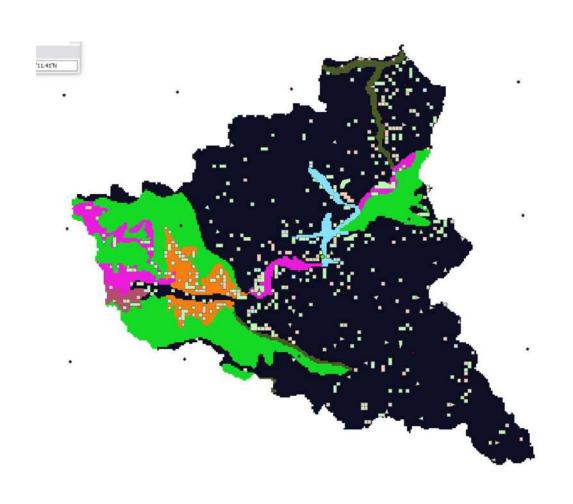




Weighted Overlay Analysis Methodology



Result of Weighted Overlay Analysis



Google representation of Weighted Overlay Analysis



Physical Targets for the year 2018-2019

Sr. No.	Project	1 st qtr. (April-June)	2 nd qtr. (July-September)	3 rd qtr. (October-December)	4 th qtr. (January-March)
1.	DST Sponsored Project "Studies on improving livelihood generation through scientific interventions in Pinus gerardiana Wall. and important wild mushrooms	 Survey for mapping of <i>Pinus gerardiana</i> sites: Field visit to Forest Range Office Pooh for procuring compartment history file. Selected grid wise field survey of <i>Pinus gerardiana</i> of Pooh Range. Compilation of recorded data of Pooh Ranges through software i.e. Erdas Imagine and Arc GIS. Launch Workshop 	 Survey for mapping of <i>Pinus gerardiana</i> sites: Field visit to Forest Range Office of Morang for procuring compartment history File Selected grid wise field survey of <i>Pinus gerardiana</i> of Moorang Range. Compilation of recorded data of Moorang Ranges through software i.e. Erdas Imagine and Arc GIS. 	 Survey for mapping of <i>Pinus gerardiana</i> sites: Field visit to Forest Range Office of Kalpa for procuring compartment history File. Selected grid wise field survey of <i>Pinus gerardiana</i> of Kalpa Range. Field visit to Forest Range Office Kilba for procuring compartment history file. Selected grid wise field survey of <i>Pinus gerardiana</i> of Kilba Range. Compilation of recorded data of Kalpa and Kilba Ranges through software i.e. Erdas Imagine and Arc GIS 	Preparation of Tehsil wise map of Kinnaur District through digitization using Arc GIS software. Preparation of Village wise map of Kinnaur District through digitization using the same software. Digital Image Processing of Kinnaur District by using supervised and unsupervised classification method. Ground truthing for rectification and analysis.

Budget Approved

S. No.	Items	1 st Year		2 nd Year		3 rd Year		Total		Grant
		HFRI	SCSTE	HFRI	SCSTE	HFRI	SCSTE	HFRI	SCSTE	total
Recu	Recurring expenses									
1	Salaries*	11,88.000	8,88,000	11,88.000	8,88,000	12,67.200	8,88,000	36,43,200	26,64,000	63,07,200
2	Consumables	2.00.000	0	1.00.000	0	50.000	0	3,50,000	0	3,50,000
3	Contingencies	50,000	50,000	50,000	50,000	50,000	50,000	1,50,000	1,50,000	3,00,00
4	Travel	2,00,000	2,00,000	2,00,000	2,00,000	2,00,000	2,00,000	6,00,000	6,00,000	12,00,000
5	Other costs**	0	7,00,000	1,55,000	8,40,000	1,50,000	13,00,000	3,05,000	28,40,000	31,45,000
6	Overhead expenses	3,00,000	2,00,000	3,00,000	2,00,000	200,000	2,39,556	8,00,000	6,39,556	14,39,556
	Sub Total	19,38,000	20,38,000	19,93,000	21,78,000	19,17,200	26.77,556	58,48,200	68,93,556	1,27,41,7 56
Non-	Non-recurring expenses									
7	Permanent equipment	67,60,286	1,41,560	0	0	0	0	67,60,286	1,41,560	69,01,846
	Grand total	86,98,286	21,79,560	19,93,000	21,78,000	19,17,200	26.77,556	1,26,08,48 6	70,35,116	1,96,43,60 2

^{*}HFRI (JRF-2, PA-2; SCSTE (PA-2, Field worker/ Helper-2)

^{**} Onsite trainings, conference/workshop, temporary field station)



Studies on Improving Livelihood Generation Through Scientific Interventions in *Pinus gerardiana* Wall. and Important Wild Mushrooms in Himachal Pradesh

Nodal Officer

Sh. Kunal Satyarthi, IFS Member Secretary,

State Council for Science, Technology & Environment, Shimla

Principal Investigators

Dr. Ashwani Tapwal, Scientist E

Sh. P. S. Negi, Scientist C

Himalayan Forest Research Institute, Shimla

Sh. Kunal Satyarthi, IFS Member Secretary,

State Council for Science, Technology & Environment, Shimla

Co-Principal Investigator

Dr. Aparna Sharma, Sr. Scientific Officer

State Council for Science, Technology & Environment, Shimla

Project Period: 3 Years

Total Project Cost: Rs. 1,96, 43,602/-

HFRI: Rs. 1,26,08,486/-

SCSTE: Rs. 70,35,116/-

Implementing Institutes

H. P. State Council for Science, Technology & Environment, Shimla Himalayan Forest Research Institute, Conifer Campus, Panthaghati, Shimla

Background

- The NW Himalaya in Himachal Pradesh exhibits lots of variation in altitude and climatic conditions and this region is rich in forest wealth, including many species of trees and great diversity in wild mushrooms.
- Kinnaur & Chamba districts of HP are inhabited by the tribal communities who are using traditional knowledge to identify the edible, poisonous and medicinal mushrooms.
- Ethno medicinal practices that involve mushrooms can be a robust platform for identifying potent species.
- Such traditional wealth is threatened by dilution of traditional practices, loss of traditional knowledge propagation, degeneration of practices due to lack of proper documentation, habitat erosion, extinction of species and invasive species dominance.

Current status

- 1.5 million species of fungi exist in nature (Hawksworth, 2004) and about 50% of them have been characterized (Manoharachary et al., 2005).
- 2,000 species of edible mushroom all over the world and 283 edible species from India (Adhikari, 2000; Purkayastha and Chandra, 1985) out of which some are cultivated, in addition, 2000 species have been suggested to possess medicinal properties (Chang and Miles, 2004).
- The mushrooms are now recognized as a source of nutraceuticals in nutrient balancing, strengthening human immune system, enhancing natural body resistance, and lowering proneness to disease (Rahi et al., 2005).
- Mushrooms contain polyphenols, polysaccharides, vitamins and minerals. Studies show that mushrooms possess various bioactivities, such as antioxidant, anti-inflammatory, anticancer, immunomodulatory, antimicrobial, hepatoprotective, antidiabetic properties and low levels of calories, fat and toxic metals (**Zhang** *et al.*, **2014**, **2016**).
- Polysaccharides are the best known metabolite present in mushrooms with antitumor and immunomodulating properties (Rahi and Malik, 2015).

Current status

- Attri et al. (2016) has elaborated the work done on various aspects of the species recorded in India under family Russulaceae.
- **Kumar and Sharma (2011)** described 66 mushroom species from J&K representing 33 genera under 22 families with ethnomycological information.
- Lakhanpal and coworkers (since 1976) have recorded more than 300 species of mushrooms and toadstools from North-Western Himalayas; of these more than 70 species were observed to enter into mycorrhizal relationship with various forest tree species.
- Out of 1.5 million fungal species, about 140,000 are considered macrofungi/ mushrooms, of which only 10% are known (Chang and Miles, 2004).
- Periodic collection of mushrooms diversity from the nature and their genetic characterization for novelty will form the backbone for meeting the requirements of strategic and anticipatory research in mushrooms (Yadav and Tewari, 2008).

Objectives

- Exploration, identification and conservation of wild edible, poisonous and medicinally important mushrooms.
- Biochemical characterization of important wild mushrooms.
- Training of rural households on conservation and preservation of important wild mushroom.
- Geo-tagging of species wise location in the study area.

Recommendations of expert group meeting

- 1. Previous studies carried out on mushroom have to be taken into consideration and research gaps be found.
- 2. As discussed in the meeting selection of study area is good as it is relatively unexplored and this region has to be explored extensively so that new mushroom species could be added to the existing list.
- 3. Molecular characterization of all mushroom should be carried out.
- 4. Medicinal value of *Morchella* should be given more importance.
- 5. Cultivation of some high value fungi should be incorporated in the project rather than only culturing all mushrooms.
- 6. Trial cultivation of important wild mushrooms could be carried out at IARI Research Station, Dhanda, Near Totu, Shimla and also in selected Panchyats in the study area.
- 7. New culture of mushroom species should be raised and preserved for future use/reference after the completion of the project.
- 8. Traditional knowledge of Kinnaur regarding medicinal and nutritional uses of important wild mushrooms should be documented.
- 9. DNA finger printing of the important wild mushrooms should be carried out.

Budget Approved

S.	Items	1 st Y	1 st Year		2 nd Year		3 rd Year		Total	
No.		HFRI	SCSTE	HFRI	SCSTE	HFRI	SCSTE	HFRI	SCSTE	total
Recui	Recurring expenses									
1	Salaries*	11,88.000	8,88,000	11,88.000	8,88,000	12,67.200	8,88,000	36,43,200	26,64,000	63,07,200
2	Consumables	2.00.000	0	1.00.000	0	50.000	0	3,50,000	0	3,50,000
3	Contingencies	50,000	50,000	50,000	50,000	50,000	50,000	1,50,000	1,50,000	3,00,00
4	Travel	2,00,000	2,00,000	2,00,000	2,00,000	2,00,000	2,00,000	6,00,000	6,00,000	12,00,000
5	Other costs**	0	7,00,000	1,55,000	8,40,000	1,50,000	13,00,000	3,05,000	28,40,000	31,45,000
6	Overhead expenses	3,00,000	2,00,000	3,00,000	2,00,000	200,000	2,39,556	8,00,000	6,39,556	14,39,556
	Sub Total	19,38,000	20,38,000	19,93,000	21,78,000	19,17,200	26.77,556	58,48,200	68,93,556	1,27,41,7 56
Non-r	Non-recurring expenses									
7	Permanent equipment	67,60,286	1,41,560	0	0	0	0	67,60,286	1,41,560	69,01,846
	Grand total	86,98,286	21,79,560	19,93,000	21,78,000	19,17,200	26.77,556	1,26,08,486	70,35,116	1,96,43,602

^{*}HFRI (JRF-2, PA-2; SCSTE (PA-2, Field worker/ Helper-2)
** Onsite trainings, conference/workshop, temporary field station)

Work Plan

Activities		2017-18			2018-19				2019-20			
	1	2	3	4	1	2	3	4	1	2	3	4
1. Ethnomycological survey & geotagging of mushrooms												
2. Culture isolation & maintenance												
3. Taxonomical identification, preservation and value addition												
4. Biochemical characterization												
5. Sensitization trainings												
6. Fungal germplasm conservation & report writing								V			√	

Methodology to be adopted

Study area

Study area: District Kinnaur

•**Altitude:** 1500 - > 6800 m amsl

•Climate: Temperate and Arid

•Annual rainfall: 816 mm (lower parts)

•Vegetation: i) Temperate (1600-3500m); ii)

Sub-alpine (2900-3500m); iii) Alpine

(>3500m).

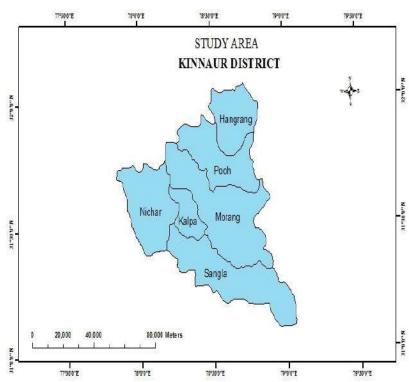
Cedrus deodara, Pinus gerardiana, Juniperus, Betula, Picea, Abies, Rhododendron, Pinus wallichiana, Pinus roxburghii, Quercus, Fraxinus, Prunus etc.

•**Total Area**: 6,401 km²

• Villages: 660

•**Population:** 84121 (**ST**: 57.95%, **SC**: 17.53 %)

•Literacy rate: 72.16%



Study area

Study area: Bharmour & Pangi

•**Altitude:** ≈ 1700-3800 m amsl

•Climate: Temperate

•Annual rainfall: ≈ 1200 mm

•Vegetation: Pinus wallichiana, Cedrus deodara, Pinus gerardiana, Quercus incana, Albizia, Dalbergia, Grewia, Toona etc.

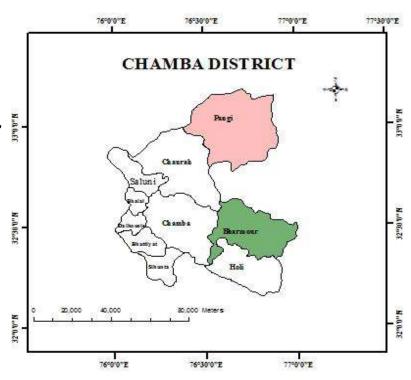
•**Total Area:** 1818 Km^{2/} 1601 Km²

• Villages: 238

•Population: 39,108 (**ST**: 82.12%; **SC:** 11.66%)

: 18,868 (ST: 90.18%; SC: 6.60%)

•Literacy rate : 64.84%/ 71.02%



Ethnomycological study

- i. Designing of questionnaire
- ii. Visit different forests and fringe villages
- iii. Interview local people and traditional healers (vaids)

HIMALAYAN FOREST RESEARCH INSTITUTE, SHIMLA Questionnaire for the collection of ethnomycological information on the wild mushrooms

Project Title: Studies on improving livelihood generation through scientific interventions in *Pinus gerardiana* Wall. and important wild mushrooms in Himachal Pradesh

I. General Information

Respondent name	Village
Tehsil	Age
Gender	Religion
No. of family members	Occupation
Education level	Average Family income

II. Ethnomycological Information

Local name of Mushroom	Common Name	
Time/ season of collection	Method of collection	
Edible/ inedible/	Identifying Features	
poisonous/ hellucinogenic		
Medicinal uses, if any	Disease for which used	
Method of use/ drug	Other uses	
preparation		
Amount collected/ season	Income from mushrooms	
Nearest Forest (Name the	Distance up to which	
place of collection)	collection made	
Habitat (on tree/ wood/	Associated tree species	
soil/litter/termites mount		
Nearest Market	Major market	
Market Price	Method of preservation	
Recipes	Any other information	
Common edible	Common poisonous	
mushrooms	mushrooms	
Common medicinal		
mushrooms		

III. PERCEPTION TOWARDS TO NUTRITIONAL ASPECTS OF MUSHROOMS

Parameter	Yes	No	Don't Know
All mushrooms are poisonous			
All mushrooms are edible			
Mushrooms can be used as substitute meat			
Mushroom is usually consumed for its nutritional values than its taste			
Mushroom is rich in dietary protein			
Mushroom increase cholesterol level in the body			
Mushroom are rich in vitamin			
Mushroom consumption makes obess			
The shelf life of mushroom is short as compared to other food			
Mushroom have no crude fibres			
Mushrooms are commonly used by traditional medical practitioners			
Mushroom cause diseases			
Edible mushroom identification require experience and expertise			
Mushrooms can be cultivated			
Reports on mushroom killing people reduce the level of my			
consumption			
Mushroom is not popular as other food			
It is difficult to gather from the wild			
It is not readily available all the time			
Knowledge about commercial production of mushrooms			

Survey and collection

- i. Collect mushrooms in different seasons
- ii. Record macro-characteristics of fresh mushroom fruiting body (colour, shape, size, odour).
- iii.Record GPS coordinate (Lat., Long., Altitude, Aspect) for geo tagging.
- iv. Place of collection
- v. Season (Date) of collection
- vi. Habit and habitat (Mycorrhizal/parasitic/saprophytic).
- vii. Host/ substrate (Associated tree species).
- viii. Solitary/two/group
- ix. Plant species growing in surroundings.

Taxonomical Identification

i. Macroscopic characters:

- » Stipe (present/ absent & size)
- » Pielus (Texture, Shape, Size, Colour)
- » Presence of Gills/ pores/ tubes & their no. per cm²
- » Odor/smell
- » Spore print
- » Colour reaction

Taxonomical Identification

ii. Microscopic characters:

- » Shape, size, colour and ornamentation of spores
- » Hymenophore surface basidia or asci
- » Lamellae surface (hymenophore), trama, edge
- » Mycelial characters
- » Standard taxonomic keys & websites

Phytochemical Analysis

- » Reducing sugars
- » Terpenoids
- » Flavonoids
- » Saponins
- » Tannins
- » Alkaloids
- » Cardiac glycosides

Biochemical Characterization

Moisture content

Proximate Analysis of mushrooms (protein, carbohydrate, fat, fibre, ash)

➤ Elemental analysis (C, N, P, K, S, Ca, Mg, Na, Cu, Mn, Fe, Zn, As, Co, Hg, Ni, Pb)

Vitamins and amino acids.

Antioxidant and antimicrobial activity

Antioxidant Potential:

- DPPH radical scavenging assay
- (**DPPH**) + (**H-A**) (**Purple**)



DPPH-H + (A) (Yellow)

Antimicrobial activity

- Gram positive bacteria
- Gram negative bacteria
- Plant pathogenic fungi

Fungal germplasm conservation

- i. Cultures will be raised on artificial media.
- ii. Pure cultures will be maintained in active state under laboratory conditions.
- iii. At low temperature/ mineral oil.
- iv. Culture will also be submitted to national repositories.

DNA fingerprinting

- Fruiting body
- Culture
 - DNA isolation
 - DNA amplification by PCR
 - Gel electrophoresis
 - Gel doc
 - Sequencing
 - Bioinformatics analysis



Value addition

- i. Preservation
 - > Dry: Oven/ sun dry/ warm air dry
 - > Wet: Sugar, Salt, caning

ii. Proximate analysis, Phytochemical analysis and composition of important elements at six monthly intervals for the preserved specimens.

iii. Preparation of prickles/ jams etc.

Sensitization Trainings

- > Ecological and Economic importance of wild mushrooms
- > Strategies for the conservation of wild mushrooms
- > Long term storage.
- Cultivation technology.

Cultivation of important mushroom species

- Pleurotus sp.
- Ganoderma lucidum

Expected outcome

- Conservation of ethno-mycological and genetic resources of the important wild mushrooms.
- · Biochemical profile of important species will be known.
- Preservation methods for long term storage will be standardised.
- Rural people will be sensitized on importance and conservation aspects wild mushrooms.
- Capacity buildings of local peoples on mushroom cultivation as additional livelihood option.
- Cultures of important mushrooms will be available after project period.

Work done

Ethnomycological documentation

- Questionnaire designed
- Villages surveyed: 13
- People contacted: 72
- All people have knowledge of Morchella

















Survey and collection

- Samples collected: 72
- **Genera**: 25
- Species identified: 6
- Families: 12
- Edible: 3
- Medicinal: 9
- Mycorrhizal: 2
- Parasitic: 2











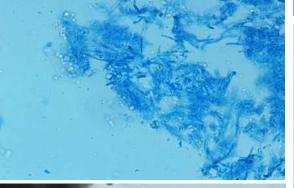


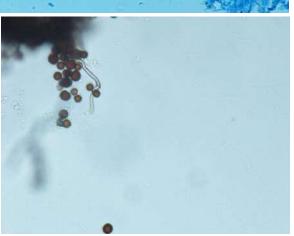


Astraeus hygrometricus (Pers.) Morgan

- Sample No.: HFRIM-1003
- **Date of collection:** May, 2018
- **Site of collection:** Riba, Kinnaur
- **Family**: Diplocystaceae
- **Common name:** Hygroscopic earthstar
- **Description:** Sporocarp is round to slightly compressed, 2-4 cm broad, exoperidium splitting into 6-12 rays; rays thick, leathery, the inner surface cracked, grey to brown, hygroscopic, spore sac globose to flattened, 1.5-3.0 cm broad, sessile, buff-brown, light-grey to mediumbrown, the surface, rupturing via an irregular slit or tear; gleba at first white, brown at maturity, columella absent. Spores 7.5-11 µm, nearly round, warted, brown in mass.
- **Occurrence:** Solitary, scattered in groups in sandy soil, mycorrhizal.
- **Ethnomycology**: Inedible, reported edible and medicinal in literature .











Ganoderma lucidum (Curtis) P. Karst

Sample No.: HFRIM-1014

• **Date of collection:** May, 2018

• **Site of collection:** Bari, Kinnaur

• Family: Ganodermataceae

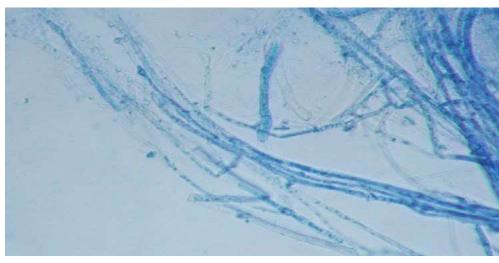
• **Common name:** Rishi

- Description: The cap is more or less fan shaped, woody to corky, upper surface is shiny varnished, red to reddish brown in colour. Stipe is lateral in origin, reddish black and brittle. Pores on lower surface, whitish in colour and turn brown with age.
- **Occurrence:**. Saprophyte or parasite on trees.
- **Ethnomycology:** Inedible, great nutraceutical significance





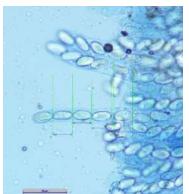




Morchella conica Pers.

- Sample No.: HFRIM-1032
- **Date of collection:** May, 2018
- **Site of collection:** Katgaon, Kinnaur
- Family: Morchellaceae
- Common name: Gucchi
- Description: Pileus is elongated, more or less conical shape. Pits are elongated and more and or less rectangular in form, yellow when young and turn brownish or black at maturity. Stipe is stout, hollow, cylindrical or swollen at base.
- **Occurrence:** Occur on ground in mixed coniferous forests.
- **Ethnomycology**: Edible, medicinal, commercially harvested from wild.









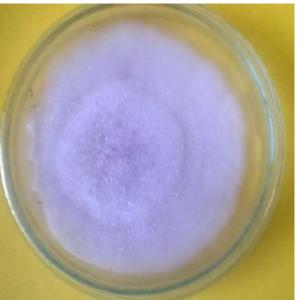
Culture isolation & maintenance

- Pure cultures raised: 15
- Maintained on PDA









Expenditure (up to 31st May, 2018)

S. No.	Items	Budget received	Expenditure					
Recurring expenses								
1	Salaries	7,92.000	6,08,052					
2	Consumables	2.00.000	1,98,946					
3	Contingencies	50,000	25,973					
4	Travel	1,66,272	70,127					
5	Other costs	0	0					
6	Overhead expenses	3,00,000	3,00,000					
	Sub Total	15,08,272	12,02,918					
Non-recurring expenses								
7	Permanent equipment	67,60,286	54,71,148					
	Grand total	82,68,558	66,74,066					



Studies on Improving Livelihood Generation Through Scientific Interventions in *Pinus gerardiana* Wall. and Important Wild Mushrooms in Himachal Pradesh

Nodal Officer

Sh. Kunal Satyarthi, IFS Member Secretary,

H.P. Council for Science, Technology & Environment, Shimla

Principal Investigators

Dr. Ashwani Tapwal, Scientist E

Sh. P. S. Negi, Scientist C

Himalayan Forest Research Institute, Shimla

Sh. Kunal Satyarthi, IFS Member Secretary,

Himachal Pradesh Council for Science, Technology & Environment, Shimla

Co-Principal Investigator

Dr. Aparna Sharma, Sr. Scientific Officer

H.P. Council for Science, Technology & Environment, Shimla

Project Period: 3 Years

Total Project Cost: Rs. 1,96, 43,602/-

HFRI: Rs. 1,26,08,486/-

SCSTE: Rs. 70,35,116/-

Implementing Institutes

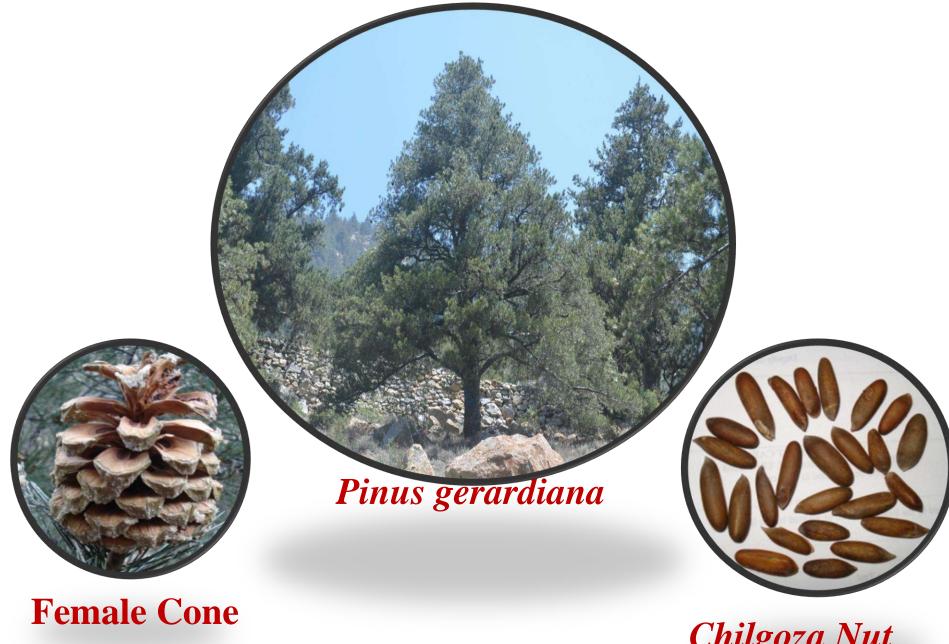
Himachal Pradesh Council for Science, Technology & Environment, Shimla Himalayan Forest Research Institute, Conifer Campus, Panthaghati, Shimla

HFRI COMPONENT

Chilgoza Pine Component

Chilgoza Pine (Pinus gerardiana Wall):

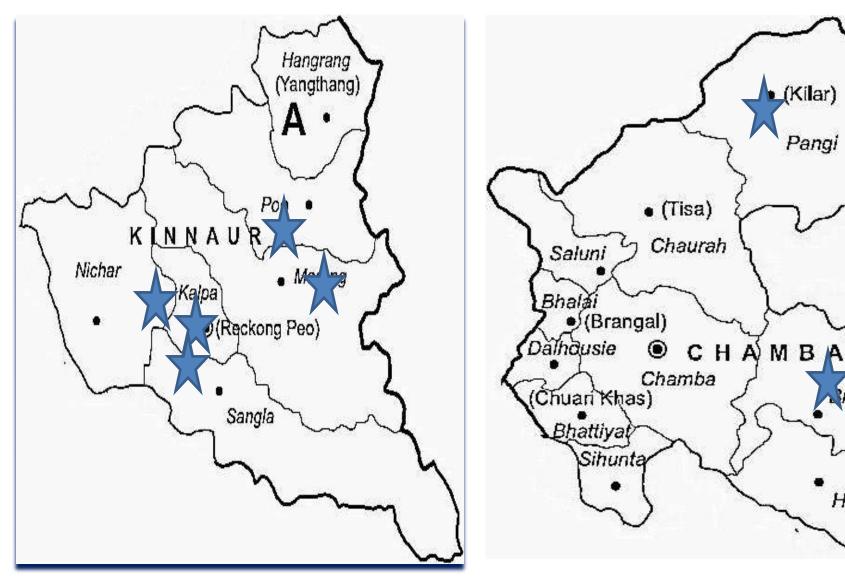
- ➤ Moderate size tree with compact appearance, 10-20m tall with usually deep, wide and open crowns.
- ➤ Popularly called as "Champion of Rocky Mountains" due to it ability to grow in rocky habitat.
- Locally known as Chilgoza or Neoza, Ree in Kinnaur, Miri in Chamba and Chiri or Galboza, Kashti in Kashmir and Chilgoza/Jhalgoza in Afghanistan.
- Endemic species listed in near threatened category as per IUCN.
- > Only Pine yielding edible nuts, highly relished by people.
- Socio-eco-ecologically an important conifer species with multifaceted uses in their zone of occurrence.



Chilgoza Nut

Distribution:

- ➤ Sparse distribution confined to Eastern Afghanistan, North-Pakistan and North-western Himalayan region of India.
- Mainly distributed in dry temperate forest in inner ranges of Western Himalaya at elevations ranging from 1800 to 3350m above msl.
- ➤ Occurs mainly in Sutlej Valley in Kinnaur District, some pockets of Pangi and Bharmour area in Chamba district of H.P.
- Dachhin area in the Marwah valley of Doda (J&K).



Chilgoza Growing Areas, Kinnaur

Chilgoza Growing Areas, Chamba

rahmaur

Holi



A View of Pinus gerardiana Forest, Kinnaur

Area under Chilgoza Forest in H.P.:

Covers around 2844.53 ha. area in Kinnaur and >35ha. area in Chamba district of H.P.

S. No.	Name of Forest Range	Area in Ha.
1	Kalpa Forest Range	777.8
2	Moorang Forest Range	1435.83
3	Pooh forest Range	630.9
Total		2844.53

- ➤ In Chamba, Killar, Bharmour, Salori and Holi Ranges
- Grows in association with Cedrus deodara, Pinus wallichiana, Quercus ilex, Fraxinus xanthoxyloides, Alnus nitida, Oles cuspidata and Celtis australis.

Uses of Chilgoza Pine:

- > Chilgoza nuts are rich source of fats, carbohydrates and proteins.
- ➤ Medicinally used for general debility, lowering high cholesterol level, cardiac problems.
- ➤ Oil used for dressing of wounds, chronic arthritis, respiratory complaints, burns, cough and cold etc.
- ➤ Multipurpose tree species used for fuel wood, fencing, bedding for cattles.
- Nuts used for preparation of garlands to be offered to local deities, relatives and guests during marriage ceremonies.
- ➤ Nuts also used in preparation of local Namkeen Tea "Cha".



Nuts used as Garland

Threats to Chilgoza Pine:

- ➤ Chilgoza is important cash crops of Kinnaur.
- > Presently sold @ Rs.1500-1800/kg in the market.
- ➤ Over harvesting and intensive grazing causing poor regeneration in its zone of occurrence.
- Each and every cone is lopped for harvesting of cones.
- Regeneration (<15%) occurs in areas inaccessible for harvesting.
- ➤ Developmental activities especially construction of HEP's, roads poses a serious challenge for the survival of Chilgoza trees in their zone of occurrence.



Chilgoza Pine growing in Crevices of Rocks, Kinnaur



Excessively Lopped Chilgoza Pine Trees



Damage to Chilgoza Forest Due to Developmental Activities

Past Work:

- ➤ Banyal (2010) conducted study on germination behaviour of *Pinus gerardiana* seeds treated with different pre-sowing treatments and concluded that seeds given stratification treatment recorded 88.00% germination followed by BAP 2000ppm (72.00%).
- Malik et al. (2012) conducted studies on natural regeneration of Chilgoza Pine in H.P. and reported very poor regeneration (15%) in IHR and suggested suitable strategy and action plan i/c sustainable harvesting methods for conservation of this important conifer.
- Thakur et al. (2012) conducted studies on drying, packaging and storage of Chilgoza nuts and reported that solar tunnel drier is the best drying mode and glass jar best materials for packaging and storage of Chilgoza nuts.

followed by crown height, however, genotypic coefficient of variation was less than phenotypic coefficient of variation which may be due to influence of environment on the expression of these traits.

>Khurram and Shalizi (2016) conducted study on traditional and alternative techniques of Chilgoza Pine nut harvesting and reported that use of traditional techniques and equipment for cone harvesting damages the tree and advocated

> Ranot and Sharma (2015) conducted genetic variation

studies on morphometric traits of Chilgoza Pine and reported

high phenotypic coefficient of variation for weight per cone

use of pole pruners, tree tongs for cone collection.

Malik et al. (2013) conducted seed storage trials in Chilgoza pine by using different storage containers and conditions and reported that seeds stored in earthen pot at 0°C maintains 58% viability.

Objectives

Component –I (*Pinus gerardiana*)

- 1. To study current harvesting practices and its impact on cone production.
- 2. To determine maturity indices for seed collection and suitable storage conditions for enhancing seed longevity.
- 3. To screen out best seed sources for raising quality planting stock.
- 4. Mapping of *Pinus gerardiana* geographical area and best seed source locations.
- 5. Development of extension material for dissemination of technology to end users and awareness generation.

Recommendations of Planning-cum-Review meeting held on 29-03-2018:

- 1. Previous studies carried out on *Pinus gerardiana* have to be taken in to consideration and research gaps would be found out to work in the project.
- 2. Steps should be initiated to declare *Pinus gerardiana* as "Theme Tree" for Kinnaur through appropriate notification.
- 3. Efforts should be made to develop *Pinus gerardiana* plantations outside natural forests.
 - Planting *Pinus gerardiana* on all govt./project premises
 - Promoting *Pinus gerardiana* plantations on private lands.
- 4. Comparison of old and new practices of harvesting of cones should be done.
- 5. Germplasm conservation nursery/arboretum of *Pinus gerardiana* should be raised from seeds collected from different sources.
- 6. Protocols should be standardized on grading and packaging of Chilgoza nuts/seeds.
- 7. The economic value of Chilgoza seed heavily depends upon storage condition. Moisture content in its seeds reduces its shelf life. Therefore, methods of seed storage and roasting techniques should be considered and steps should be taken for value addition of Chilgoza for marketing and improved post harvesting techniques.
- 8. In conventional nurseries, high velocity wind affect *Pinus gerardiana* saplings. Therefore, it was recommended that **Trench Method** may be adopted for growing plants for raising good quality nursery.
- 9. One of the major components for raising good quality nursery is the use of **Mycorrhiza** in association with *Pinus gerardiana* planting. This has to be taken in to consideration as it reduces toxicity, drought and pathogenic attack on the plants.
- 10. Efforts should be made to undertake a review of all studies as pruners/collecting tools developed till now and best possible equipment should be further improved.
- 11. Existing harvesting tools should be taken in to consideration and they should be improvise thereafter by multiple material testing i.e., Aluminium alloy, iron and carbon fibers.
- 12. Information can also be gathered from women self help groups in RHRS, Sharbo with training of collection and packaging.
- 13. Leaflets and booklets should be prepared based on available information of best practices and thematic importance of Chilgoza for the launch work shop.
- 14. Comparative pictorial poster for creating awareness regarding economic losses due to heavy lopping of branches with economic value should be prepared and distributed to Panchayats for display.

Budget Approved

S.	Items	1 st Year		2 nd Year		3 rd Year		Total		Grant	
No.		HFRI	SCSTE	HFRI	SCSTE	HFRI	SCSTE	HFRI	SCSTE	total	
Recui	Recurring expenses										
1	Salaries*	11,88.000	8,88,000	11,88.000	8,88,000	12,67.200	8,88,000	36,43,200	26,64,000	63,07,200	
2	Consumables	2.00.000	0	1.00.000	0	50.000	0	3,50,000	0	3,50,000	
3	Contingencies	50,000	50,000	50,000	50,000	50,000	50,000	1,50,000	1,50,000	3,00,00	
4	Travel	2,00,000	2,00,000	2,00,000	2,00,000	2,00,000	2,00,000	6,00,000	6,00,000	12,00,000	
5	Other costs**	0	7,00,000	1,55,000	8,40,000	1,50,000	13,00,000	3,05,000	28,40,000	31,45,000	
6	Overhead expenses	3,00,000	2,00,000	3,00,000	2,00,000	200,000	2,39,556	8,00,000	6,39,556	14,39,556	
	Sub Total	19,38,000	20,38,000	19,93,000	21,78,000	19,17,200	26.77,556	58,48,200	68,93,556	1,27,41,7 56	
Non-recurring expenses											
7	Permanent equipment	67,60,286	1,41,560	0	0	0	0	67,60,286	1,41,560	69,01,846	
	Grand total	86,98,286	21,79,560	19,93,000	21,78,000	19,17,200	26.77,556	1,26,08,486	70,35,116	1,96,43,602	

^{*}HFRI (JRF-2, PA-2; SCSTE (PA-2, Field worker/ Helper-2)
** Onsite trainings, conference/workshop, temporary field station)

Work plan (Pinus gerardiana)

Activities		2017-18			2018-19				2019-20			
	1	2	3	4	1	2	3	4	1	2	3	4
Survey for selection of sites/villages for		1	1		1	$\sqrt{}$	1			V		
collection of information on current												
harvesting practices of cones/seeds in H.P.												
Collection of Information on Current		1				√	V		V	√		
Harvesting Practices.												
Study of harvesting methods:			V				V		V			
Collection of Cone from the selected sites.		1	1				V				$\sqrt{}$	
Seed extraction and drying in the laboratory.		1	V			$\sqrt{}$	V			1	V	
Seed Maturity Indices studies:		1	V		1	$\sqrt{}$	1	1	1		V	
Seed Viability-cum-Longevity Studies.			1				1	1	1		$\sqrt{}$	√
Seed Source Variability Studies.			V		1	$\sqrt{}$	1	1	$\sqrt{}$	1	1	
Recording of data, analysis and compilation of		V	V	V	1	$\sqrt{}$	1	1	V	1	V	
report.												
Development of extension material for									1			
dissemination of technology to end users.												

Methodology-cum-Work Plan (Pinus gerardiana):

- □ Survey for selection of sites/villages for collection of information on current harvesting practices of cones/seeds in Himachal Pradesh.
- Survey will be carried out to select the sites/villages for documentation of information on current harvesting practices and collection of Chilgoza cone/seeds.
- Minimum 2 villages from each Chilgoza growing forest ranges will be selected for the study.

Work Plan Contd.....

□Collection of Information on Current Harvesting Practices:

- ➤ Questionnaire will be prepared for collection of information on current harvesting practices of Chilgoza cones/seeds.
- ➤ Information on harvesting practices of cones from the trees, extraction of nuts from the cones presently followed by the local right holders will be collected.
- ➤ 10 per cent of the total household in a village will be selected randomly for collection of information on current harvesting practices.

■Study of harvesting methods:

- Comparative study on harvesting practices practised by local people and mechanized harvesting through multi-angular long reach pruner will be carried out to see the variation in production of new cones/shoots.
- A minimum of 30 trees will be selected for the comparative study in selected Chilgoza Pine forest at least in two localities.

□ Collection of cones from the selected sites:

Cones will be collected from the selected sites for conducting seed germination and longevity studies.

■ Seed extraction and drying in the laboratory:

Cones after collection from the field will be brought to the laboratory and seeds will be extracted and dried in the laboratory.





Mechanized harvesting by Long Reach Pruner

☐ Seed Maturity Indices studies:

- Maturity indices studies will be carried out during collection of cones by local people across the altitudinal range in Kinnaur.
- ➤ Cones will be collected on 15 days interval starting from 1st Sept., to 31st Oct., of the calendar year for conducting seed maturity indices studies.
- ➤ Parameters for developing seed maturity indices viz., cone colour, seed colour, cone and seed dimensions, moisture content of seeds and specific gravity of cones under different collection dates will be recorded.
- ➤ Germination trials of the seeds collected under different collection dates will be conducted to find out suitable time for collection of Chilgoza seeds.

☐ Seed Viability-cum-Longevity Studies:

- ➤ Viability of freshly collected seeds will be tested through Germination and Tetrazolium test (TZ) test.
- ➤ Seed longevity studies will be conducted by laying out seed storage trials using different storage containers and storage conditions to enhance shelf life and viability of the seeds.
- Seeds will be stored in different storage containers under different storage conditions (storage temperature) and viability of stored seeds will be tested as per standard procedures by following ISTA norms.
- Most suitable storage containers and storage conditions will be identified for packaging and enhancing shelf life of Chilgoza nuts.

☐ Seed Source Variability Studies:

- ➤ Seeds will be collected from different seed sources in Kinnaur and Chamba district along with GPS data.
- Geographical coordinates viz., altitude, latitude and longitude of the seed sources will be collected.
- ➤ Sunken Trench beds (15mx5mx1.5m) will be prepared for raising of seedlings as suggested by PCCF (HoFF).
- ➤ Germination trials of seeds collected from different seed sources will be laid out in the nursery.
- ➤ Germination along with growth data of seedlings viz, shoot length, root length, number of roots, root: shoot ratio etc., will be recorded in the nursery.

- ➤ Growth performance of seedlings raised from different seed sources will be evaluated for selection of best seed sources for raising of quality planting stock in the nursery and will be geo-referenced.
- > Seedlings will be inoculated with mycorrhizal fungii for raising quality seedlings in the nursery.
- Seedlings raised in the nursery will be distributed to the local people and other stakeholders for its planting in Govt./ Project Premises and private lands.
- Figure 3.2. Germplasm conservation nursery/arboretum of *Pinus* gerardiana will be be raised from seeds collected from different sources.

□ Density Assessment Study:

- Density assessment study of *Pinus gerardiana* will be carried out to assess the density of Chilgoza Pine trees in its natural zone.
- ➤ Quadrate size of 10mx10m will be laid out for assessing number of tree per quadrate.
- ➤ Minimum 20 quadrate will be laid out randomly in selected Chilgoza growing forest in different beats of Kinnaur and Chamba districts.

□ Recording of data, analysis and preparation of report:

➤ Data of various experimental trials will be recorded periodically. After statistical analysis and compilation of data, final technical report will be prepared.

□ Development of extension material for dissemination of technology to end users:

- Extension material in the form of booklet/pamphlet will be generated for dissemination of technology to the end users.
- Training programmes will be organized for dissemination of research findings to the local tribal communities, personnel's of state forest department and other end users in Himachal Pradesh.

Chilgoza Component:

- Survey carried out for selection of sites/villages for collection of information on current harvesting practices of seeds in Kinnaur.
- ➤ Questionnaire designed and collected information on current harvesting practices followed by people in 7 villages viz., Kilba, Tangling, Kalpa, Pangi, Ribba ,Akpa and Janghi villages.



Interviewing local people on current Harvesting Practices



- During the period, collected cones/seeds of *Pinus* gerardiana from Kinnaur and seeds extracted from the cones in the laboratory.
- Recorded maturity indices parameters viz., Cone length, Cone width, Cone weight, Seed length, Seed Width, no. of seeds/cones, cone and seed colour.





Seeds extraction in the laboratory

- ➤ Viability testing of freshly collected seeds from Rarang carried out through Tetrazolium chloride (TZ) in the laboratory.
- >>90 % seeds were viable as per TZ test conducted in the laboratory.





Viability Testing of *Pinus gerardiana*Seeds in the laboratory

STATUS OF PROGRESS:

Recorded Geo- coordinates of 12 Chilgoza Pine growing areas in Kinnaur district during the field tour to Kinnaur.

Rarang Tangling Kilba Jami Punang Shaung Image @ 2018 CNES / Airbus

Seed storage trials of *Pinus gerardiana* laid out by using four storage containers viz., Jute bag, Polybag, Plastic bottles, Earthen Pots under three different storage conditions viz., room temperature, -5°C and -10°C in the laboratory and viability testing of stored seeds carried out periodically after every three months.

Seeds stored under different storage containers and storage temperature retained viability of 72.00 % to 87.00% after 6 months of storage period.

Identified Locations of *Pinus gerardiana* in Kinnaur district

Sr. No.	Name	Beat	Block	Range	Division	Altitude	Latitude	Longitude	
	of Site					(m)			
1	Jani	Jani	Choltu	Bhabanagar	Kinnaur	2123	31°30′59.4″	78004'44.2"	
2	Punang	Punang	Choltu	Kilba	Kinnaur	2123	31°30′38.3″	78005'50.6"	
3	Kilba	Kilba	Kilba	Kilba	Kinnaur	1867	31°30°44.5"	78009'38.1"	
4	Shaung	Shong		Kilba	Kinnaur	2165	31°26′36.8"	78012'38.2"	
5	Barang	Barang	Shongtong	Kalpa	Kinnaur	2023	31°30′55.4″	78016'04.5"	
6	Kalpa	Kalpa	Kalpa	Kalpa	Kinnaur	2592	31°32'05.4"	78015'01.0"	
7	Ribba	Ribba	Ribba	Moorang	Kinnaur	2301	31°35'2.0"	78°21'50	
8	Rarang	Akpa	Janghi	Moorang	Kinnaur	2655	31°35′59.0"	78°22'05.3"	
9	Janghi	Janghi	Janghi	Moorang	Kinnaur	2673	31°36'39.7"	78°25'44"	
10	Lappo	Asrang	Sangla	Sangla	Sarahan	2989	31°39°27.2"	78°20'36.8"	
11	Lippa	Lippa	Janghi	Moorang	Kinnaur	2644	31°39'19.8"	78°23'11.1"	
12	Tangling	Tangling	Shongtong	Kalpa	Kinnaur	2182	31°31'35.4"	78 ⁰ 16'55.2"	

Expenditure (up to 31st May, 2018)

S. No.	Items	Budget received	Expenditure						
Recurring expenses									
1	Salaries	7,92.000	6,08,052						
2	Consumables	2.00.000	1,98,946						
3	Contingencies	50,000	25,973						
4	Travel	1,66,272	70,127						
5	Other costs	0	0						
6	Overhead expenses	3,00,000	3,00,000						
	Sub Total	15,08,272	12,02,918						
Non-recurring expenses									
7	Permanent equipment	67,60,286	54,71,148						
	Grand total	82,68,558	66,74,066						

Expected outcome of the project:

- Development of complete package on proper cone harvesting methods, maturity indices for seed collection and screening of best seed sources of Chilgoza Pine.
- ➤ Best seed sources identified will certainly help in raising of quality nursery stock which will ultimately help in raising high quality plantations in future.
- Seedlings will be raised for distribution to local communities and other stakeholder for carrying out plantation in the area.
- ➤ Project findings will result in development of research papers, technical reports, extension material for the benefit of various stakeholders.
- ➤ Project will help in creating awareness among the local communities for conservation and sustainable utilization of Chilgoza.

Impact on society after implementation

- Local tribal communities will be sensitized and encouraged to adopt the sustainable harvesting technique Chilgoza cones.
- Seed storage methods developed will be utilized by the local people and SFD's officials for storage of seeds for their use during lean seed period.
- Best seed sources identified will certainly help in raising of quality nursery stock by SFD.
- Seedlings of *Pinus gerardiana* will be distributed to local communities and other end users for carrying out its planting for its conservation.
- It will also help in securing livelihood of local tribal communities residing in Pangi-Bharmour and Kinnaur area of Himachal Pradesh.





Fungi Under Exploitation for Commercial/ Consumption Purposes



Morels – Morchella esculenta



- Morels (gucchhi) *Morchella* spp. growing only in wild - most valued wild mushroom in Western Europe particularly France, Germany, Italy and Switzerland
- International trade in dried morels is estimated to 225 tons annually
- The suppliers are India, China, Turkey, Pakistan, North America and Eastern Europe



- India and Pakistan each exports to nearly65 tons annually
- One estimate claims that 2,89,000 persons are engaged annually in Pakistan in morel mushroom hunting on part time basis including 33% women, 27% men and 40% children from March to July months

- Cost for one kilogram dried morels - US \$ 50 for the collector, \$ 166 for wholesaler, \$ 216 for exporter \$ 330 for the importer
- In Himachal Pradesh and Jammu & Kashmir morels are collected systematically during the growing seasons (spring and sometimes after rainy season) and sold to established markets both fresh and as dried mushrooms.
- On line sale is also on from Himachal Pradesh (www.alibaba.com).



Termitomyces microcarpus



Termitomyces microcarpus



Termitomyces spp.

In Madhya Pradesh and Chattisgarh in central India this wild mushroom is sold in the local markets and provide sustenance to the tribal people and forest dwellers during the lean period (rainy season) when other non-wood forest products are not available in the forests.

Nearly 2.5 tons estimated to be sold in 15 tribal weekly markets during one growing season in Madhya Pradesh

A trade of Rs 25000 was estimated in four tribal markets in and around Mandla district during the season (Harsh et al. 1993).

Can be compared with morels in nutritional value, flavour and trade prospects.





Worshipping termite mounds on a Nagpanchami (Snake worship day) in India – *Termitomyces* growing on the worshipped mounds are not collected/ eaten – Conservation approach



Astraeus hygrometricus (Puttu, Putputa)

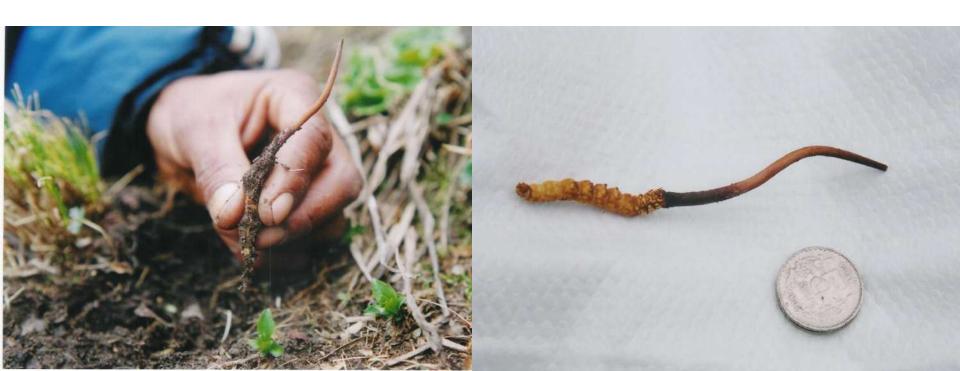


Ophiocordyceps
sinensis – Caterpillar
fungus (Yartcha
Gunbu)





Ophiocordyceps sinensis collection and fungus-larva



Caterpillar fungus (Ophiocordyceps sinensis)

An important nutraceutical fungus, caterpillar fungus collected from the alpine meadows (3200 – 4000 m amsl) of the Himalaya and fetch good price in Chinese market nearly US\$ 10000 per kilogram.

The scenario is such that whole village (nearly 80 per cent population) except elderly and small children go and stay in the alpine meadows taking makeshift tents, beddings and food to sustain for nearly three months as soon as the snow starts melting in March – April in these areas for collection.

Members of the family come back on leave from jobs so that they can contribute in *O. sinensis* collection due to its higher economic return.

A primary collector can collect about 45 to 55 mummified larvae and fungus in a season.

In Munsyari market alone nearly 90 kg of the produce was sold in 2009.

About 3-5 quintals of *O. sinensis* per annum illegally traded from Dharchula (India) to Nepal and finally to International market.

Before 1995 there were only a few collectors and they did not use to get good price, however, the number of collectors as well as collect keep on increasing till 2007. Official records tell that quantity has reduced from 90 kg to 60 kg from 2009 to 2012 in Munsyari alone.

The sources reveal that the collection is declining gradually after 2007 as the number of collectors are increasing every year and disturbing the habitat and fragile ecology of the Himalaya.

During collection period - tea shops and restaurants and transportation of food material to the collection areas - about 48000 employment days was generated per year for the local.

In 2013 on June 16 – 17 cloud burst and massive land slides not only caused habitat destruction but also loss of life of many collectors – some were rescued by army using helicopters











King of the herbs – *Ganoderma lucidum*

- **◆** Ganoderma lucidum Considered as a 'King of Chinese Traditional Medicine', commonly known as Ling-zhi/ Lingzhi (China), Reishi (Japan), Young-zhi, Biladi Top, The King of Herbs, Royal Gano, Chaga (in Russia), etc.
- **◆** Cast in the terms of Chinese Traditional Medicine, it includes: nourishing, supplementing, toning, removing toxins, and dispersing accumulation.
- Indicated for neurasthenia, nervousness, dizziness, insomnia, high blood pressure, high cholesterol, chronic hepatitis, cancer, AIDS/ARC, nephritis, bronchial asthma, allergies, pneumonia, stomach disease, coronary heart disease, diabetes, angina, mushroom poisoning, fatigue, and for enhancing longevity

- ♦ Ganoderma nutriceuticals are used as a remedy to treat more than 20 different illness including migraine and headache, hypertension, arthritis, bronchitis, asthma, gastritis, hypercholesterolaemia, hepatitis, cardiovascular problems and cancer including leukemia a new therapy known as ganotherapy has come in practice and gaining fast access in the modern day medicines.
- **◆** Today, an estimated 5000 tons of *Ganoderma* is produced yearly in the world, with China producing 3,000 tons followed by Korea, Taiwan, Japan, Thailand, USA, Malaysia, Vietnam, Indonesia and Sri Lanka World turnover 2.16 billion dollars Rs 1000 crore
- **◆**Ganoderma lucidum grows throughout India at different climatic and edaphic conditions and enjoys a wide host range in forest tree species reported on 63 tree hosts in India.
- **◆**There exists a wide range of variety and variability in the size, shape and colour in the fruit bodies of *G. lucidum* collected from different hosts and locations



Cantharellus cibarius (Chanterelles)

Delicious much in demand in Europe, exported from PoK to France

Ectomycorrhizal with conifers

Hericium erinaceus fruiting from a tree hollow



H. coralloides on oak (Quercus sp.)





The cup fungi – *Peziza* sp.



Stink horns – *Phallus indusiatus*







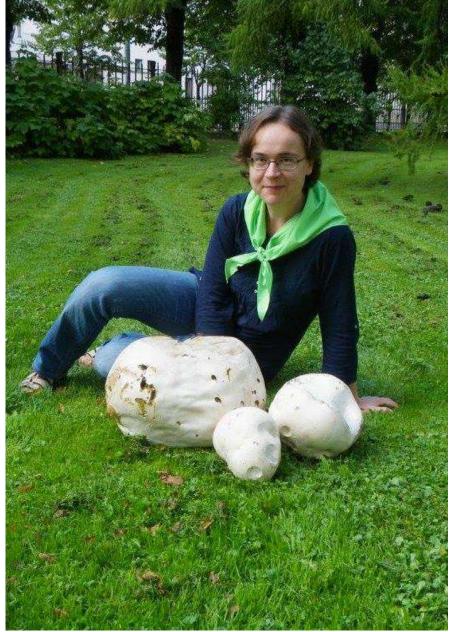
Stink horns – Phallus impudicus and Clathrus rubra



Clathrus rubra







Giant puffball – Calvatia gigantia (Photos by Milan Gjorgon)



Earthstar – Geaster triplex



Photo by Alison Pouliot

Bird nest fungus – Cyathus striatus



Chicken of the woods – *Laetiporus sulphureus*



Beefsteak fungus – Fistulina hepatica



Turkey tail fungus – *Trametes versicolor*



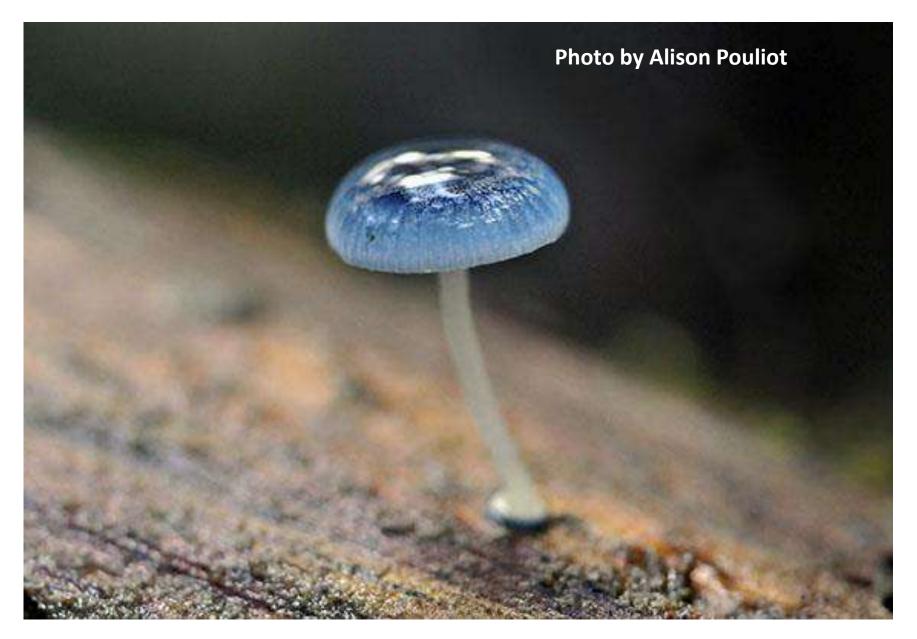
Phellinus pachyphloeus

– largest fruiting body
reported from Kalsi,
Dehradun (151 x 142 x
57 cm, circum. 427 cm)

JoTT 9:11085-11086, 2017



Macrocybe titans (photo: Dr. Lokho Puni from Imphal)



Mycena interrupta- blue tiny mushroom



Golden jelly bells – *Heterotextus miltinus*



Pink parasols



Chlorociboria aeruginascens



Amanita muscaria – Fly agaric



Phellinus linteus – being sold at Siem Reap International Airport, Cambodia



.... Miles to go

Fungi are Biodiversity too!

- Biodiversity the variation of life forms within a given ecosystem, biome or on the entire Earth
- Earth today consists of many millions of distinct biological species
- We know practically all the birds, and almost all the mammals, that inhabit the earth - we know only a small fraction of the arthropods and fungi
- So far approximately a million insects described
- Fungi between 70,000 and 100,000
- The professionals know that huge numbers of both groups have not yet been described

- In 1990 the magnitude of fungal diversity was estimated conservatively at 1.5 million species by David Hawksworth.
- Almost 200 years of mycology only 6 -7 percent of fungi are known !!
- Fungi in the forest ecosystem act as the decomposers, augmenters and pathogens and provide an interesting group of organisms which depend largely for their survival and growth on climatic factors like moisture, temperature and nutrients.
- A vast majority of fungi are microscopic, living in the soil, litter, water, and in close association with plants, animals, and other organisms.
- Morphologically they are single-celled to multi-cellular, microscopic to macroscopic, have different shapes, structures and colours.
- The diversity exists not only between different groups and genera but even within the same species.

 Out of about 27500 described species of fungi from India 15500 are terrestrial litter fungi, 327 coprophilous and 450 endophytic fungi (India's Fifth Report to the Convention on Biological Diversity 2014)

Table 1. Fungal genera

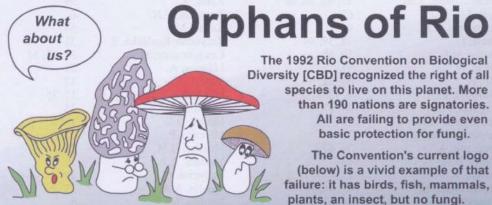
Phyla	World	India
Myxomycotina	450	380
Mastigomycotina	308	205
Zygomycotina	55	50
Ascomycotina	2000	745
Basidiomycotina	357	232
Deuteromycotina	4100	468
Total	7270	2080

Source: Fungal biodiversity: Distribution, conservation and prospecting of fungi from India by C. Manoharachary, K. Sridhar, Reena Singh, Alok Adholeya, T. S. Suryanarayanan, Seema Rawat and B. N. Johri, Current Science 89:58-71, 2005.

- Fungi are facing the threats to their existence due to loss of habitat and hosts, over exploitation, climate change, developmental activities, pollution, etc.
- Unfortunately the fungi are paid least attention when one talks of biodiversity.
- The 193 countries which are signatories to the CBD are failing to realize the importance of fungi and their conservation.
- The current logo of the United Nations Decade on Biodiversity (2011 – 2020) is a vivid example of this failure which does not find a place for fungi though it shows other organisms.



Poster by Prof. David Minter



The 1992 Rio Convention on Biological Diversity [CBD] recognized the right of all species to live on this planet. More than 190 nations are signatories.

All are failing to provide even basic protection for fungi.

The Convention's current logo (below) is a vivid example of that failure: it has birds, fish, mammals, plants, an insect, but no fungi.

Country	Animals	Fungi	Plants
Austria	104	26	85
Belgium	201	18	145
Bulgaria	193	23	221
Cyprus	130	5	94
Czech Republic	213	11	140
Denmark	309	21	144
Estonia	100	20	76
European Union	296	2	58
Finland	222	90	245
France	22	2	16
Germany	140	5	153
Greece	119	1	138
Hungary	126	6	126
Ireland	126	2	26
Italy	183	8	110
Latvia	103	11	96
Lithuania	464	95	266
Luxembourg	46	0	50
Malta	435	8	319
Netherlands	80	6	53
Poland	47	11	45
Portugal	400	4	318
Romania	166	5	79
Slovakia	183	26	188
Slovenia	387	10	126
Spain	221	0	42
Sweden	282	28	175
UK	292	94	347

Number of times animal, fungal and plant words occurred in CBD country reports from European Union countries

Fungal conservationists have adapted the logo of the UN Decade on Biodiversity (right), in a way which supports its aim to protect wildlife, but also draws attention to the huge inadequacy of current provisions for nature conservation.



United Nations Decade on Biodiversity

of the Convention has to submit reports about its work to protect the natural world. You can read these reports on the Internet.

The table (left) lists European Union countries. with a count for each of the number of times words for animals (like

bird, fish, mammal or reptile), for fungi (like mushroom, mould or truffle), and for plants (like moss, flower or tree) occur.

In every case, fungi are grossly underrated. The failure to protect fungi is not only widespread, it is also institutional.

It's not just animals and plants ... Fungi are Biodiversity too! United Nations Decade on Biodiversity For more information go to www.fungal-conservation.org

 Due to the inadequacy in realizing the role and importance of fungi, **Professor David** Minter of **Commonwealth Agriculture Bureau International** (CABI), Surrev. **England has rightly called the fungi** "Orphans Rio" the of as considering that all other organisms other than fungi find mention in the national reports on biodiversity.



Opportunities - Convention on Biological Diversity (CBD)

- CBD initiated by United Nations Environment Programme (UNEP) in 1988
- 1992 adopted (Rio "Earth Summit")
- Dec 1993: 168 signatories (COP)
- Biodiversity = "living organisms from all sources..."
- Genetic material = "of plant, animal, microbial or other origin ..."
- Art. 9: "ex-situ conservation of and research on plants, animals and micro-organisms ..."

Aichi Biodiversity Targets

Target 12:

 By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.

Target 17:

 "By 2015, each Partyhas developed and has commenced implementing ...an effective ... National Biodiversity Strategy and Action Plan (NBSAP)"

Target 19:

 "By 2020 knowledge, the science base, and technologies relating to biodiversity, its values, are improved, widely shared and transferred, and applied".

Fungi are necessarily included in these targets

NBSAPs

- National Biodiversity Strategies and Action Plans
- At national level India's 5th National Report 2014
- Fungi 'entitled' to feature in NBSAP
- Parties who have not yet submitted a post-2010 NBSAP: 157
- Nations are "required to integrate consideration of the conservation and sustainable use of biological resources into national decision-making, ..."

Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA)

Secretariat at Montreal; 193 parties (COP)

Functions:

- To help implement the CBD's Strategic Plan;
- To set operational objectives and ways to achieve them
- To justify the choice of operational targets
- To serve as a guide to all biodiversity stakeholders

SBSTTA-17 & Fungi

(UNEP/CBD/SBSTTA/17/L.1, p. 12)

..."The United Nation's recently adopted system of environmental-economic accounting (SEEA) would allow for the accounting of ecosystem services in national accounts. The World Bank had also developed a new partnership programme for Wealth Accounting and Valuation of Ecosystem Services (WAVES) that was currently piloted in six countries."

Fungi and Ecosystem Services

- soil formation
- plant primary production
- regulation of plant and animal populations and communities.
- modification of pollutants
- carbon sequestration & storage

Intergovernmental Science-Policy Platform on Biodiversity and Ecosystems Services (IPBES) under IUCN modelled on the success of IPCC

SBSTTA - ISFC & Fungi

2011:

- Fungal conservation not on SBSTTA meeting agenda
- ISFC was mentioned in *intervention* by Cook Islands (concerning effects of invasive alien species)

2013:

SBSTTA-17 (Montreal, 14-18 October 2013)

New and Emerging Issues paper (UNEP/CBD/SBSTTA/17/L.3, p. 14):

- 63. Additional efforts should be made in a number of areas including *inter alia*:
- (b) Conducting IUCN Red List assessments, or comparable assessments, for species of plants, fungi, invertebrates and marine and freshwater realms

Global Strategy for Plant Conservation (GSPC)

- In 2002, the Conference of the Parties (COP), by <u>decision VI/9</u>, adopted the <u>Global Strategy for Plant Conservation</u>
- In 2010, the Conference of the Parties, by <u>decision X/17</u>, adopted the <u>Updated Global Strategy for Plant Conservation</u>
- Five objectives (2011-2020), incl. better knowledge of species, sustainable and equitable use & recommended enhancement of taxonomic capacities.
- National Focal Points

Global Strategy for Plant Conservation (GSPC)

Tag line:

"Without plants, there is no life. The functioning of the planet, and our survival, depends upon plants.

The Strategy seeks to halt the continuing loss of plant diversity."

Can we aim for a

"Global Strategy for Fungal Conservation" (GSFC) with COP sanction?

Opportunities for Fungi?

- Ensure fungi are included in each country's NBSAP
- Include fungi in national RED lists
- Apply to IUCN for RED-listing of fungi, Global Fungal Red List Initiative launched in 2014
- In IPBES, ensure fungal mediated ecosystem services are included
- Maintain active mycology links with GTI (Global Taxonomy Initiative)
- Aspire to emulate Plant Conservation with CBD Strategy for Fungal Conservation

Following Micheli Guide to Fungal Conservation:

	India's Fourth National Report to CBD, 2009	India's Fifth National Report to CBD, 2014
Plants	277	414
Animals	80	196
Fungi	15	60
Lichens	10	22

I presume that significant increase in instances of 'fungi' and 'lichens' could be possible only after the National Focal Point was approached at the behest of the President, ISFC vide his e mail dated Jan. 28, 2014 before the finalization of the Fifth Report.

HOPE!

In order to protect, conserve and restore fungal diversity, a concerted response from governments and society is required.

Creating awareness about fungi and preparing next generation of mycologists would be crucial for this onerous and challenging task.







Thanks for Sparing Your Precious



Project Flag Start Preparing Red-List of Macro-Fungi of India

Project funded by Mohd. Bin Zayed Species Conservation Fund

Dr. N. S.K. Harsh

Dr. Ashwani Tapwal

Dr. Sangeeta Singh

Dr. R. K. Verma

Dr. V. Mohan

Mr. Rajesh Kumar

Dr. Manoj Kumar

Dr. Yashpal Sharma

Scientist-G (Retd.)

Scientist-E

Scientist-D

Scientist-F

Scientist-G

Scientist-C

Technical Officer

Professor

Project Management

North India (Hills)

Western India

Central India

South India

North-East India

North India (Plains)

North-West India





Drying and Dehydration Technology for Chilgoza Nuts

Dr NS Thakur
Professor and Principal Investigator
Department of Food Science and
Technology
Dr. YS Parmar University of Horticulture
and Forestry Nauni-Solan

Dr Somesh Sharma
Associate Professor
School of Bioengineering and Food
Technology
Shoolini University, Solan

CHILGOZA NUTS

INTRODUCTION

- * Pinus gerardiana known as the chilgoza pine
- In Persian it means 40 nuts in one cone
- ❖ Native to Northwestern Himalayas
- This species is listed as lower risk, near threatened.
- Overcutting, and intensive grazing causing poor regeneration
- Chilgoza pine is well known for its edible pine nuts rich in fats and protiens.

DISTRIBUTION OF CHILGOZA NUTS

```
• In World:
    India
    Pakistan
    Afganistan
    Tibet
   In India:
     HP
     Jammu and Kashmir
   In HP:
     Kinnaur
     Chamba
```

LIST OF SOME EDIBLE PINE NUT SPECIES

P. gerardiana	P. sibrica	P. sabiniana
P. koriensis	P. pinea	P. edulis
P. albicaulis	P. pumila	P. catarinae
P. ayacahuite	P. monticola	P. cembroides
P. cembra	P. stroabiformis	P. culminicola
P. flexilis	P. coulteri	P. discolor
P. lambertiana	P. ponderosa	P. johannis
P. quadrifolia	P. juarezensis	P. monophylla
P. lagunae	P. maximartinezii	

HEALTHFUL PROPERTIES

- Nutritious
- Stimulative
- Expectorant
- Prevents hypertension
- Stimulate cell proliferation
- Decreases blood lipids and sugars.
- Inhibits allergic reactions.

USES OF CHILGOZA NUTS

- Snack food.
- Important ingredient of :
 - *Bread, candies, cookies, sauces, cakes, vegetable and meat dishes.
- Use of nut oil in:
 - *Cosmetic beauty products
 - *Massage
- Use of oil by-products:
 - Nut flakes
 - *Chocolate
 - *Crunch bar
 - Flour
- *Pastries
- *Cakes
- *Pine milk
- *Drink

FLOWERING AND FRUITING

- Medium sized evergreen tree.
- Flowering time : May- June.
- Maturation time of female cone : Sept-Oct.
- Age of bearing cones: 20 years.
- Average yield per tree: 7-10 Kg.
- No. of nuts per cone: 140-150.

MATURITY AND HARVESTING

- Nut cone mature in 18 months after flowering.
- Cone harvested when it attains the full size having dark green color.
- Harvesting time Sept Oct.
- Harvesting: Done by cutting the end of branches supporting the cones by sickle.

CONE COLLECTION SYSTEM

- Traditional
- Division of forest area.
- Cone harvesting decided by village Panchayat.
 - Public auction to contractors.
 - Altogether collection by villagers.
- □ Modern
- Area allotted to each beneficiary.
- Family manages the harvest by:
 - Using family labour
 - Salaried labour
 - Contract
- Auction of plots of nut at village level to contractors.
- ☐ Share of chilgoza nut in total income : 5-25%.

CHILGOZA CONES COLLECTION



MATURE CHILGOZA CONES



PHYSICAL CHARACTERISTICS OF CHILGOZA CONES

Characteristics	
Length of cone* mm	137 <u>+</u> 4.1
Breadth of cone* mm	83.50 ± 2.7
Weight of cone* g	399 <u>+</u> 5.1
Number of nuts in each cone	140 ± 2.1
Weight of nuts from each cone, g	36.6 ± 2.1
Cones (Kg) required for 1 Kg nuts	12.85 ± 1.8
Number of cones required to extract 1 Kg nuts	32 ± 2.0
Moisture (Fresh Cones),%	54 <u>+</u> 1.2

NUT EXTRACTION

- Traditional
- Improved: Fully mature cones exposed to high temperature in mechanical cabinet drier at 60°C.
- Mature cones can also be exposed to solar tunnel drier at 47°C.
- Nuts extracted by a single worker in one day:
 25-30 kg

TRADITIONAL NUT EXTRACTION





Traditional nut extraction

MECHANICAL CABINET DRYING



Solar Tunnel Drying of chilgoza cones



IMPROVED NUT EXTRACTION









PHYSICAL CHARACTERISTICS OF CHILGOZA NUTS

Characteristics	Mean value		
Physical			
Length of nut, mm	18.3		
Breadth/ Diameter of nut, mm	3.95		
Nut quotient	4.62		
Weight of nut,g	0.464		
Colour of nut	Brown 200 D		
Volume of nut, ml	7.9		
Specific gravity of nut	0.058		
Length of kernel, mm	15.1		
Breadth / Diameter of kernel, mm	3.18		
Kernel quotient	4.60		
Weight of kernel, g	0.347		
Colour of kernel	GY 162 D		
Oil Yield (%) on dry weight basis	47.45		

CHEMICAL CHARACTERISTICS OF CHILGOZA NUTS

Chemical	Mean Value		
Total fats,%	6.91		
Total Protein ,%	2.00		
Total Carbohydrates, %	4.02		
Total solids (nuts), %	69.99		
Total solids (kernels),%	72.04		
Ash ,%	2.57		
Moisture (nut) %	29.6		
Moisture (kernel), %	27.0		
Water activity (Fresh)	1.0		

PRETREATMENTS OF NUTS

• Salt impregnation :

Nuts dipped in 25% brine for 8 days at ambient conditions (20-25°C)

Change of surface colour of nuts :

Nuts dipping in 25% HCl solution for 2.5 min followed by rubbing in 5% sand with water, then washing.

SURFACE IMPROVEMENT TREATMENT



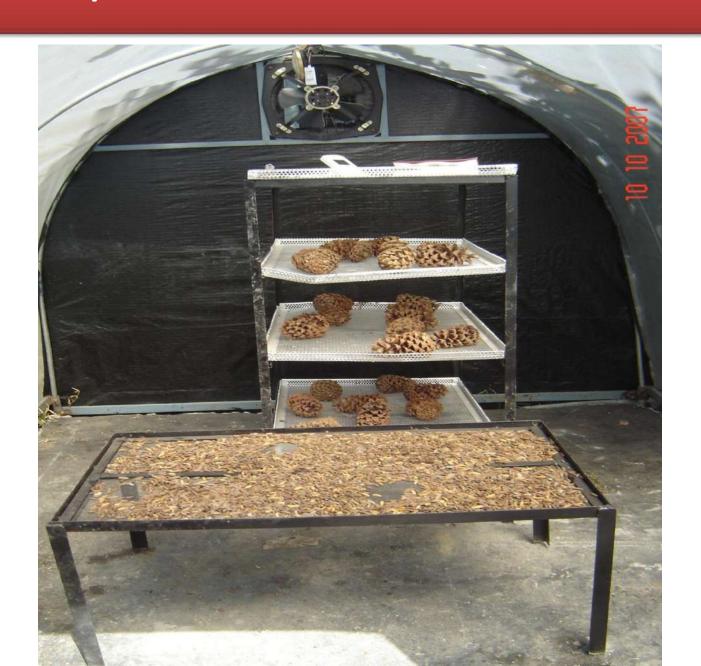
NUT DRYING

- Mechanical cabinet drier at 55°C.
- Solar tunnel drier (STD) at 45°C.
- In cabinet drier nuts dried up to 3-4% moisture level whereas, in STD, nuts dried up to 6% moisture.

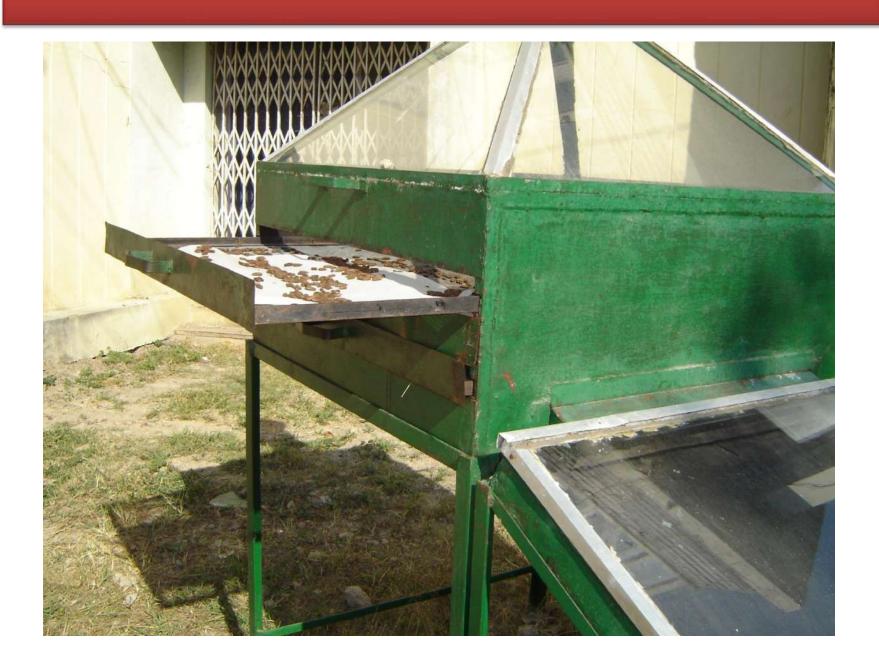
NUT DRYING IN CABINET DRIER



CONES/NUT DRYING IN SOLAR TUNNEL DRIER



NUT DRYING IN SOLAR DRIER



CHEMICAL AND SENSORY CHARACTERISTICS OF DRIED NUTS

Characteristics	Cabinet Drier	Polyethylene		
		Tunnel Drier		
Chemical Characteristics (%)				
Moisture	3.02	6.81		
Water activity	0.098	0.169		
Ash	2.93	2.85		
Protien	12.40	12.00		
Fats	52.27	49.39		
Carbohydrates	26.00	24.48		
Total sugars	19.87	17.20		
Reducing sugars	6.72	5.92		
Fibers	1.82	1.80		
Sensory Characteristics (scores)				
Colour	7.8	7.5		
Taste	7.8	7.6		
Texture	7.6	7.4		
OA	7.8	7.6		

GRADING A-I CHILGOZA NUTS

S.No	Grade	Number	Average	Characteristics
	Designation	of nuts	length	
		per 100	(mm)	
		gm		
1.	Extra	200-240	24	The chilgoza nuts
2.	Usual	255-275	18	should have the
3.	Small	380-420	13	charcteristic shape, dark brown in colour, reasonably dry and free from resin and damaged nuts.

Note: Nuts of next lower grade if any shall not exceed 5 % by weight

A-II SURFACE IMPROVED CHILGOZA NUTS

S.No	Grade	Number of	Average	Grade	Characteristics
	Designation	nuts per	length	Designation	
	(According to	100 gm	(mm)	(According to	
	Size)			quality)	
1.	Extra	200-240	24	AAA, AA, A	The chilgoza nuts
2.	T T 1	255 275	10		should have the
2.	Usual	255-275	18	AAA, AA, A	charcteristic shape,
3.	Small	380-420	13	AAA, AA, A	cream white in colour, reasonably
					dry and free from
					damaged nuts.

AAA – 80% and above cream white

AA – 40-80% cream white

A – 40% and below cream white

Note: Nuts of next lower grade if any shall not exceed 5 % by weight.

GRADES OF CHILGOZA NUTS







EXTRA USUAL SMALL

PACKAGING, STORAGE AND MARKETING

1. Packaging

- Traditional : Gunny bags
- Improved:

Aluminium laminate pouch (100 gsm)

- 250g
- 500g

Pouch Packing in CFB cartons

- 5kg
- 10 kg

2. Storage

- Traditional storage : In living rooms
- Improved: Dry and low temperature conditions,

3. Marketing

- Production of nuts: 100-300 tons per year
- Cost of fresh nuts: Rs. 250-400 per kg in the production area.
- Cost after partial drying and packing in consumer packages: Rs. 1200-1500 per kg.

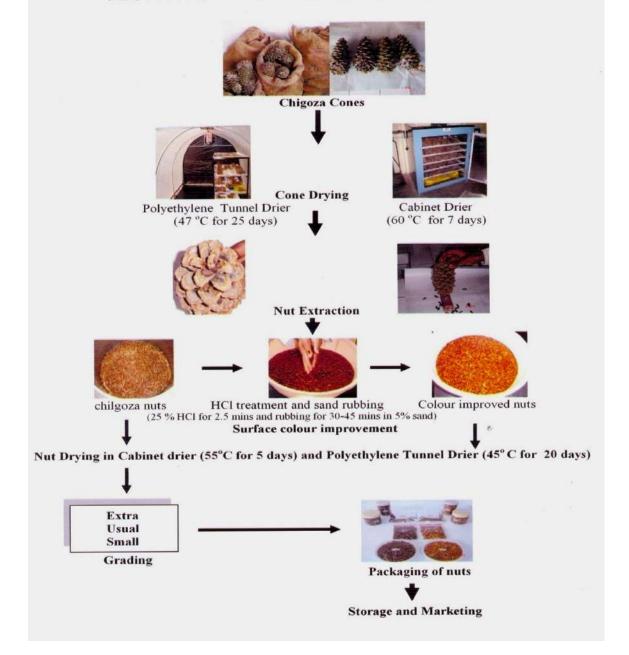
CHILGOZA NUT PACKAGING



COST OF PRODUCTION OF DRIED CHILGOZA NUTS

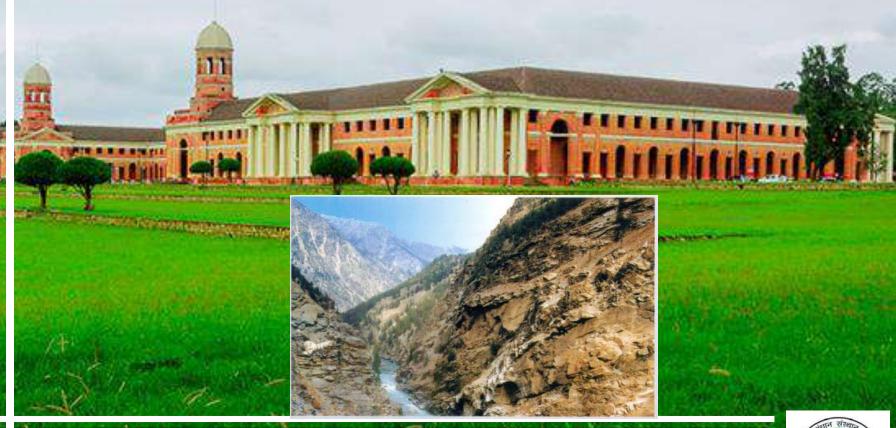
Item	Quantity	Rate (Rs.)	Amount (Rs.)	
			Cabinet Drier	Polythene tunnel drier
Nuts	10 kg	350	3500	3500
Pre-treatment cost (HCl)	625 ml/10 lots	148/ litre	9.25	9.25
Packaging material (ALP*)	41	1.00	41.00	41.00
Processing cost	@ 10%		355.03	355.03
Electricity@ 1unit /4h	30 units	!.00	30.00	
Profit	@ 10%	-	393.53	390.53
Total cost	-	-	4328.81	4295.81
Total yield @ 83.2 %	8.32 Kg			
Price per kg of dried fruit	-	-	520.29	516.32
Price per 200g pack	-	-	104.06	103.26

TECHNOLOGY OF CHILGOZA NUTS DRYING



THANKYOU

Research on Chilgoza (Pinus gerardiana)



Dr. Ombir Singh Forest Research Institute, Dehradun



P. GERARDIANA: SOME FACTS

- Commonly knows as "Chilgoza" or "Neoza".
- It is three needle pine.
- Named after its discoverer "Captain Gerard".
- It is only pine in India which provides edible nuts/Kernels.
- Played important role in socio-economic up-liftement of people in tribal areas.
- **Excellent soil binder and prevents large scale soil erosion.**
- Capable to grow on excessively dry, barren hill sides with shallow soil. As it grows under difficult conditions, hence known as" Champion of Rocks"



SOME HEALTH BENEFITS

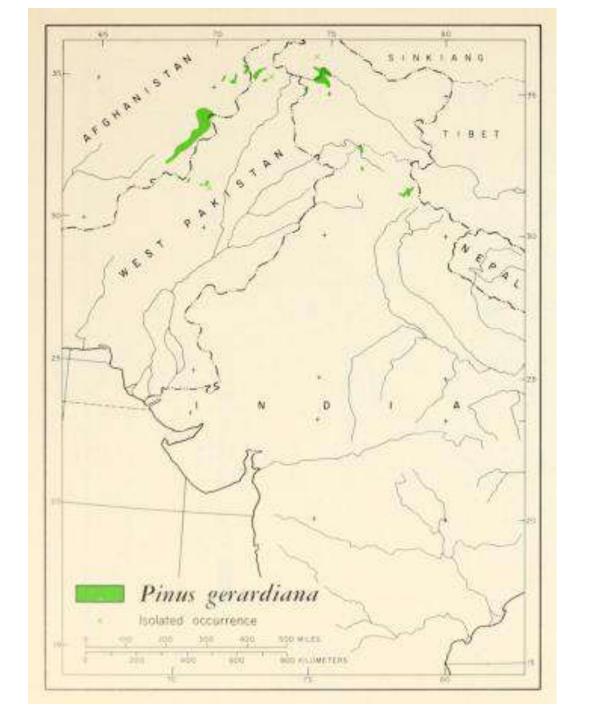
- Chilgoza nuts are extremely nutritious.
- ■Rich source of fat out of total fat, 90% are unsaturated fats, which are beneficial for lowering cholesterol levels by reducing low density lipo-protien (LDL) cholesterol.
- Contain Tocopherols, Squalene, Phytosterols, which are powerful antioxidants, prevents oxidation of lipids and reduce the generation of free radicals.
- Good source of proteins, amino acids, antioxidants likeGallocatechin, Catechin, Lutien.
- ■Pine nuts when consumed in large amount are helpful in weight gain, but when used in small amount, help in weight loss too, as it contain long chain fatty acid that induces the release of CCK-8 hormone which is satiety hormone that provides feeling of fullness and reduces appetite.

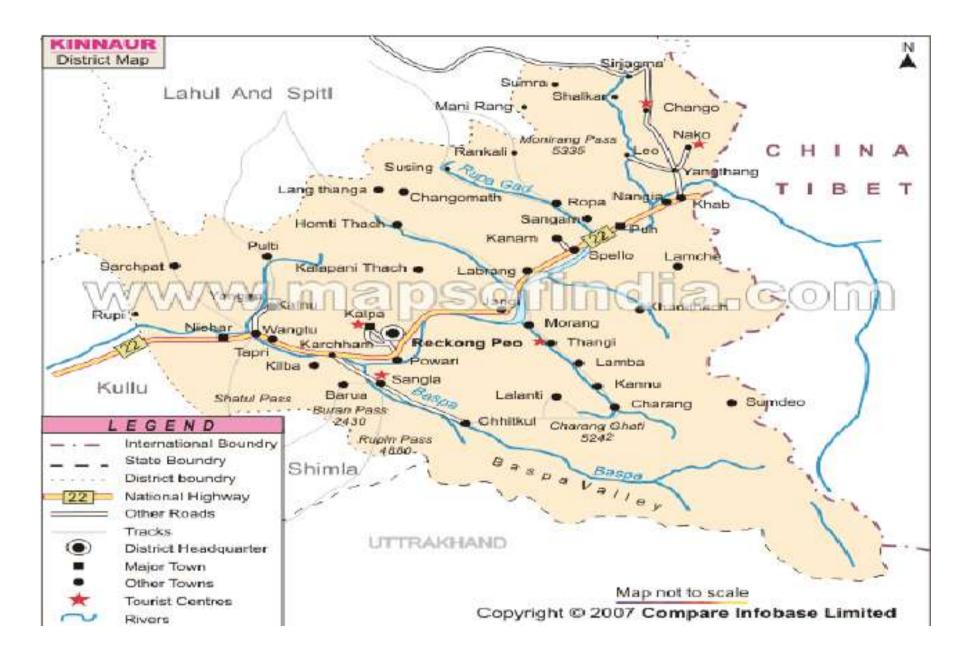




DISTRIBUTION

- •Its distribution is very sparse in the world, confined only to the mountains of Eastern Afganistan, Pakistan, India and other scattered localities in Hindu Kush Himalaya. at 30°- 37° N Latitude and 66°- 80° E Longitude.
- In India, it occurs in North-West Himalaya ranges from 31° 55′ 32° 05′ N latitude and 77° 35′-79°35′ E Longitude and grows between 1600- 3300 m amsl.
- •Rocky and dry regions of Kinnaur & Chamba districts of Himachal Pradesh and Kishtwar district of Jammu & Kashmir.
- Their habitat lie very well outside of the influence of the Monsoons but with heavy snow fall.





Chilgoza Forests of Kinnaur

•The marked termination monsoon influence beyond Wangtu in Kinnaur provides best suited environment for Chilgoza.

Two broad climatic zones:

1. Dry Zone:

1.i. Forest Type – A (4-6 km from Wangtu on south facing slopes of river Sutlej upto Kalpa)

2. Arid Zone:

2.i. Sub Zone from Kalpa to Kanam Forest Type – B,C

2.ii. Sub Zone from Kannam east wards Forest Type – D

FOREST TYPE A

- ✓ Very open forests with small stunted trees on rocky ground. *P roxburghii* is common but sparse Chilgoza on left banks of Sutlej.
- √ Trees are small sized, cone formation is also poor.
- ✓ At sholtu chilgoza replaces chirpine and west of Wangtu, Deodar, bluepine, fir, local oak also occur.
- ✓ From Urni Dhank chilgoza forests comparatively better and towards Kalpa chilgoza forests become wider.



FOREST TYPE B

- Fairly open forests, Medium sized and Superior Trees than forest type A.
- •Kalpa side is south facing and *P. gerardiana* generally grows pure or association with deodar.
- Mixed communities of chilgoza in and around Kalpa.
- •No altitudinal zonation of deodar and chilgoza on both sides of river Sutlej.

FOREST TYPE C

- •Well developed trees from Janagi to Kanam best trees in Kinnaur.
- Increased aridity provides good conditions here.
- •Good trunk, girth, branches and well spread crown.
- At Kanam forests become open again.



FOREST TYPE D

- ✓After Kanam, the slopes are bare and devoid of vegetation.
- ✓ Areas are covered with white ash like soil having Artimesia meritima and Ephedera geradiana.
- ✓ Last limit of deodar in upper Sutlej except near Dubling and in the inside valleys.
- ✓ P. geradiana here is solitary or in small numbers.



IMPORTANT

▶ Each forest type is suited to its particular region, so seeds of one forest type are likely to prove unsuitable for regeneration in another region.

SEED DISPLACEMENTS

To combat climate change and to afforest wastelands:

- √ Use quality seed
- ✓ Certified seed
- ✓ Displace seed by 1º Latitude towards lower latitudes in the range of distribution
- ✓ Displace seed by 100 m altitude towards lower altitude in the range of distribution

ASSOCIATES OF CHILGOZA

- **√** Quercus ilex
- ✓ Cedrus deodara
- √ Olea cuspidada
- ✓ Rhus succedanea, R. punjabensis
- √ Daphnae oleorosa
- ✓ Artimisia maritima
- √ Rosa webbiana
- ✓ Lonicera agustifolia, Berberis sp., desmodium sp.
- √ Indigofera geradiana
- √ Fraxinus xanthoxyloides
- √ Ephedra geradiana etc.

MORPHOLOGY

- **■**Chilgoza trees vary in between 15 24 m in height and 1.8 3.5 m in girth.
- Branches are usually small.
- Young shoots are olive green in colour.
- Needles are 5-10 cm long and dark green in colour.
- Bark is smooth, silvery grey and get peeled off in large.
- •Wood is tough, durable and comparatively heavy amongst all pines.



FLOWERING AND FRUITING

- •Flowers appear in May/June thereafter pollination takes place.
- Male and female cones appear on same tree.
- In the first year the cones show a slight in crease whereas during second year rapid increase in size.
- Each scale have two seeds.
- Seeds are cylindrical and pointed towards at one end.

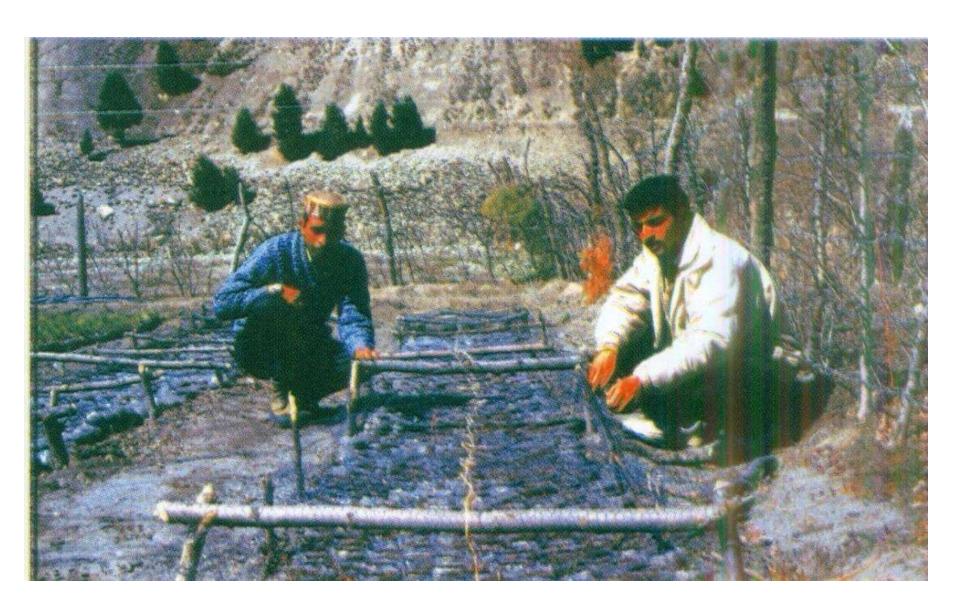


SILVICULTURAL CHRACTERS AND NATURAL REGENERATION

- Chilgoza is light demander and quite hardy tree.
- It with stands considerable cold and excessive drought.
- It is wind firm and on highly exposed situations become stunted and gnarled.
- Seeds can germinate in cervices, hollows of rocks and also under bushy plants.
- Emerging seedlings are susceptible to the insects, birds, rats, squirrels etc.
- Natural regeneration is quite scanty as all the cones are collected.
- •Studies showed that regeneration is very poor (5-15%), thus species facing higher risk of extinction and suitable strategy and action plan including sustainable harvesting, closing of area, compensation to right holders should be devised.

ARTIFICIAL REGENERATION

- **■Direct Sowing:** patches of 2x2 feet, pits of 1x1x1 feet, broadcast sowing beneath and around boulders/bushes.
- Nursery Sowing: Polythene bags 18x6 inch, placed on raised beds.
- Sowing in the months of Nov/Dec, 1-2 seed/P. bag, bags covered with wire net.
- Addition of Chilgoza Forest soil proves useful in poly-bags.
- Planting: Three season old seedlings, spacing 3x3m, seasonautumn/spring.
- Not much success in clonal propagation. However, some success have been obtained in tender shoot cleft grafting in mid of February.



Other Research Findings on Chilgoza

- •Studies on genetic parameters suggests that the seed weight, seed length and cone size have high heritability and maximum genetic gain, hence given the top priority for the improvement of *P. gerardiana*.
- Significant variations were observed in seed parameters in five seed sources (Jangi, Kalpa, Rispa, Peo and Koti) in respect of Seed length, width, 1000 seed weight, moisture contents, germination and number of cotyledons.
- High heritability along with high genetic gain in some phenotypic characters indicate that these characters can be improved by selection. Correlation and path coefficient analysis showed that needle length, clear bole height, crown width and total height can also be used for indirect selection in improving cone and nut characters of the species.

- **24** hour seed soaking in water and GA application of seeds proved useful in *P. gerardiana*.
- Mycorrizal inoculation through forest soil also found useful in nursery.
- Chilgoza pine tree growth has direct relationship with environmental conditions.
- Ring width chronology from AD 990 2005 showed that chilgoza have direct relation with the precipitation of March- July and negative with pre-monsoon temperatures.
- •So prediction models could be developed to devise possible impacts and strategies to mitigate changes of climate changes on this important species.

Chilgoza Cone Collection

Cones of Chilgoza can be collected either at:

- Village level
- Distinct level
- Household level

Important

As previous year branches contain flowers/fruiting bodies for next year crop, so should not be lopped during cone collection.



MANAGEMENT OF CHILGOZA CROP

In its natural zone, farmers should be encouraged to carry out intensive management practices to get more Chilgoza yield like:

- ✓ Addition of FYM and organic fertilzers.
- ✓ Application of suitable fungicides on the lopped branches during cone collection.
- **✓ Sustainable branch lopping.**
- ✓ Use of modern equipments for cone collection.
- ✓ Treat Chilgoza as cash crop.

SUMMARY

- Chilgoza played important role in socio-economic up-liftement of people in tribal areas, it is excellent soil binder and capable to grow on excessively dry, barren hill sides with shallow soil.
- Each forest type is suited to its particular region, so seeds of one forest type are likely to prove unsuitable for regeneration in another region.
- •As regeneration is very poor and species facing higher risk of extinction and suitable strategy and action plan should be devised.
- Mycorrizal inoculation through forest soil should be done in nursery.
- •As previous year branches contain flowers/fruiting bodies for next year crop, so lopping should be done carefully during cone collection.
- ■Improvement of *P. gerardiana* should be given top priority.
- •Enlightenment campaigns to educate the populace on the values of chilgoza, intensified efforts on plantations and sustainable management of the chilgoza forests is required.



Button Mushroom Cultivation- Livelihood Development Option for People in Mountains

Dr. Maninder Jeet Kaur



Himalayan Research Group Umesh Bhavan, Chotta Shimla, Shimla-171002 maninderjk@rediffmail.com





HIMALAYAN RESEARCH GROUP (HRG)

Himalayan Research Group is Non Government scientific organization established in 1997. It is working at grassroots level since year 2000. Organization's aim is technology transfer to the rural people for livelihood development in the Himalayan region. Working with mushroom cultivation, fodder development program, vermicomposting biotechnology, solar energy sector, medicinal plants cultivation, aromatic plants cultivation and floriculture etc.

CLASSIFICATION of Button Mushroom

Kingdom Fungi

Division: Basidiomycota

Class: Agaricomycetes

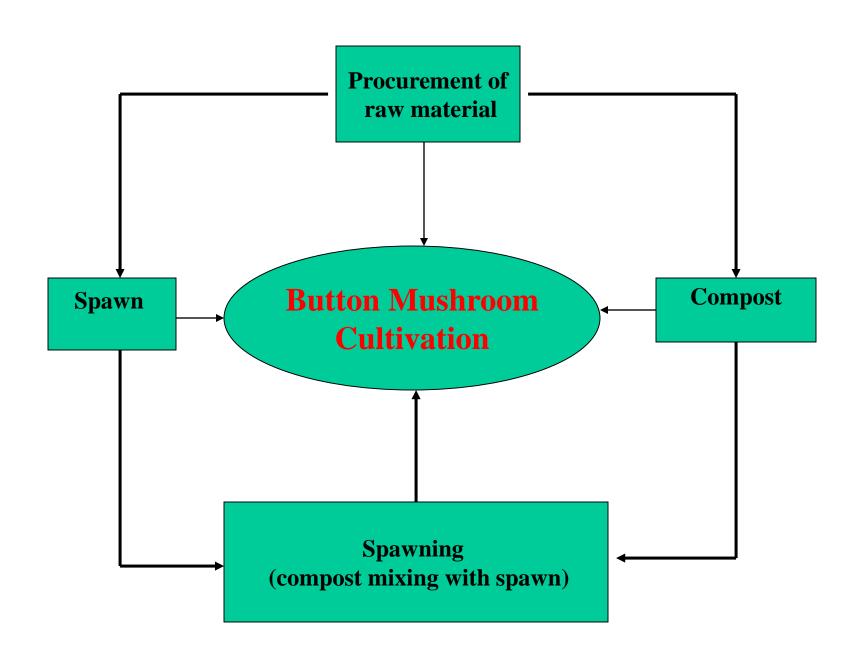
Order: Agaricales

Family: Agaricaceae

Genus: Agaricus

Species bisporus

Common name Button Mushroom



ORGANISATION OF PEOPLE and TECHNOLOGY DISSEMINATION

1. Initial Stage

One to One Meeting in the selected area

2. Second Stage

General Awareness Camp organised

Women, Youth, Farmers, Mahila Mandal Pradhan, Panchyat Pradhan, Govt. Officials at Block and District Level, Elected Representatives

3. Third Stage

Organising Technical Training through technology demonstration for cultivation

4. Fourth Stage

Provide Technology Package

From procurement of raw material till marketing





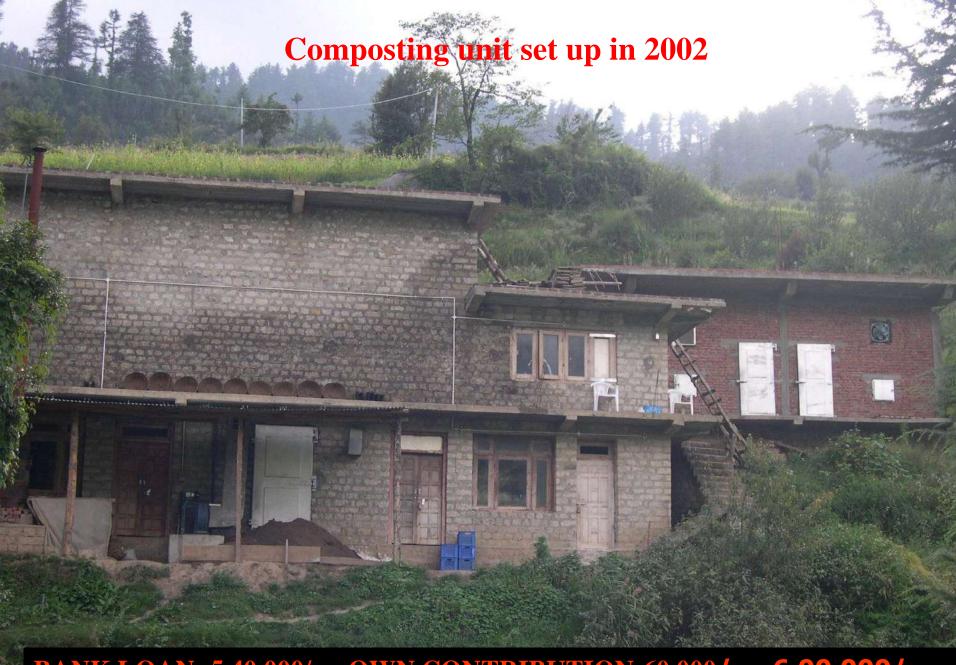




Awareness camp-Involvement of Govt. Officials

Demonstration of mushroom cultivation





BANK LOAN- 5,40,000/- +OWN CONTRIBUTION-60,000/-= 6,00,000/-





































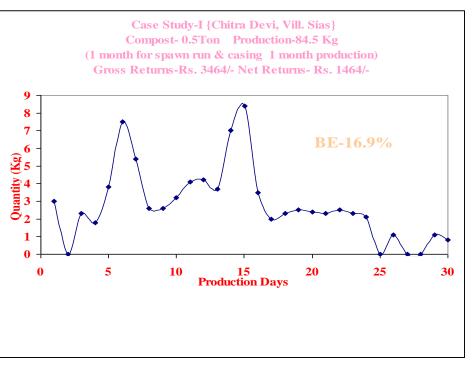




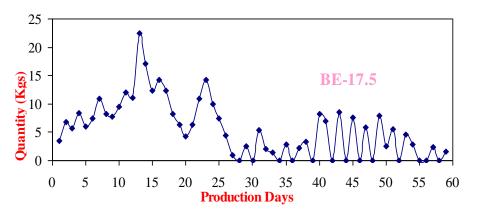




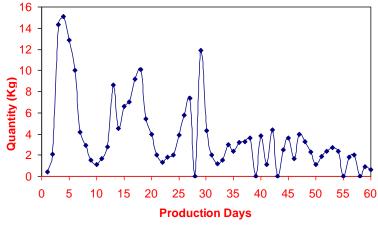




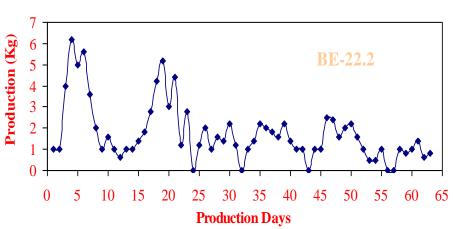
Case Study-III {Chet Ram Vill. Rewnsi}
Compostn 1.9 Ton Production-333.2 Kg
(1 month for spawn run + 2 months production)
Gross Returns-Rs. 13661/- Net Returns-Rs. 6061/



Case Study-II {Krishna Devi, Vill. Baniseri} Compos 1.25 Ton Production-227.5 Kg (1 month for spawn run + 2 months production) Gross Returns-Rs. 9327/- Net Returns- Rs. 4327/-



Mushroom Production Case Study-IV {Chaman, Vill. Dheem} compost 0.5 Ton Production-110.5 Kg
(1 month for spawn run + 1 months production)
Gross Returns-Rs. 6630/- Net Returns- Rs. 3630/-



Areas are covered under temperate zones are:

Districts of Mandi, Kullu, Shimla, Kinnaur, Bilaspur, and Kangra

Time cycle

•Compost preparation ~24-28 day

•Spawn preparation ~18-20 days

•Mushroom crop ~3 months

ECONOMICS

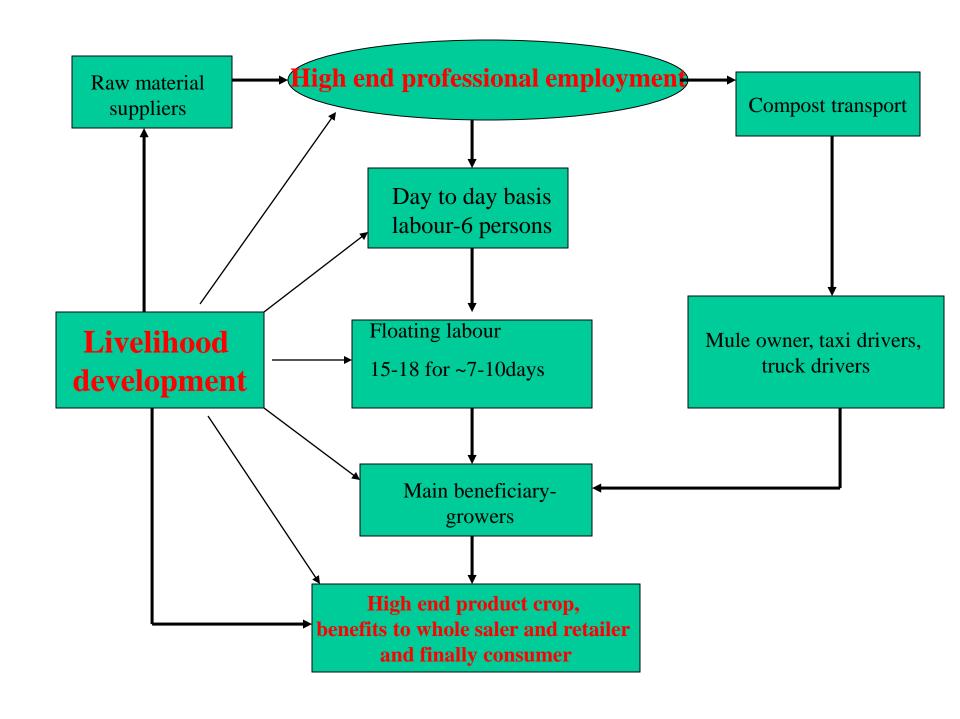
- •Total compost produce in HRG unit per annum~ 250MT in 8
- @ Rs. 9.5 per kg, 10kg for Rs. 95/-
- •Mushroom production @ 18-22%
- •Mushroom cost in market ~ Rs. 120/-kg
- **•Profit margin- 100-110%**











Pros

Environmental condition favourable

Beneficiary's interest

Availability of space n time

Readily available market

Cons

Non-availability of raw material

Few compost units

High cost of compost

THANKING YOU ALL



Pinus gerardiana Lately Discovered and Quite Early Endangered: Reasons and Solutions

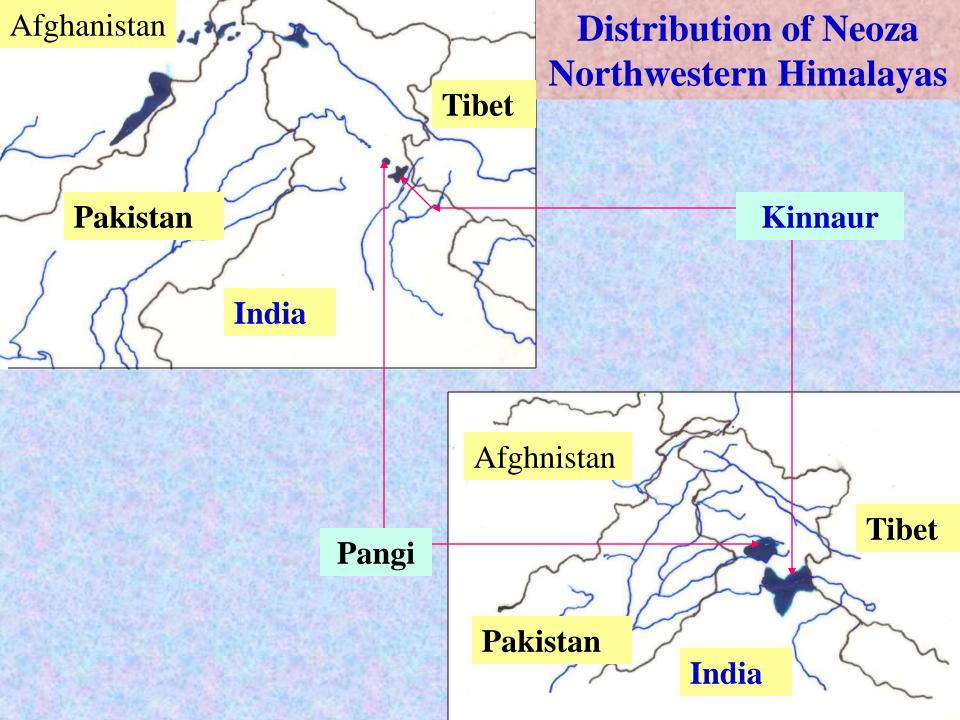
Rajan Bawa

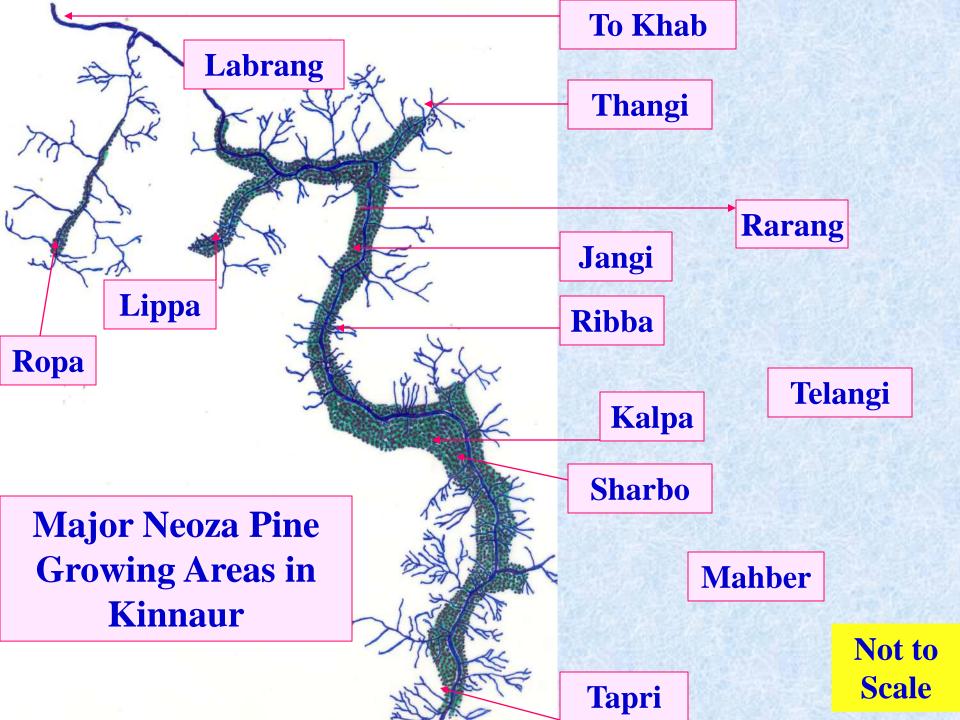
Introduction

- Discovered in 1939 by Capt Gerard
- Lord Auckland Introduced in England [Failure]

Occurrence

- Afghanistan: Chitral And Upto Northern Baluchistan
- Pakistan: In Suleiman Mountains
- India: Kinnaur [Nearly 150km Long Stretch On L&I Banks Of Satluj:Tapri To Kahb-2020 ha] Best Between Chini To Jangi
- Small Patches Pangi + Bharmour Area 40 ha
- Kashmir: Kishtwar And Astor
- Tibet
- Separated By Close Relative *P bungeana* 1,300 Mil Long Tibetan Plateau







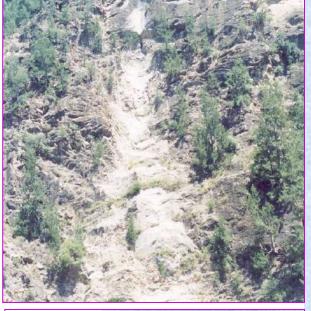




Habitat

From 700 to 3500 m Occupies separate ecological niche disjunctive distribution Prefers rocky and dry regions Outside the influence of monsoon Withstands +380 to -150C

- · Xerophytic in nature
- · Avoids water logged areas
- In valley bottoms ppt 50: 50 [2400 m hot and rocky aspects - replaces P. roxburghii]
- Deep inside where more snow-on cooler aspects: pure community
- · Establishes well on rocky crevices
- · In arid limit areas with complete snow
 - sheltered sites



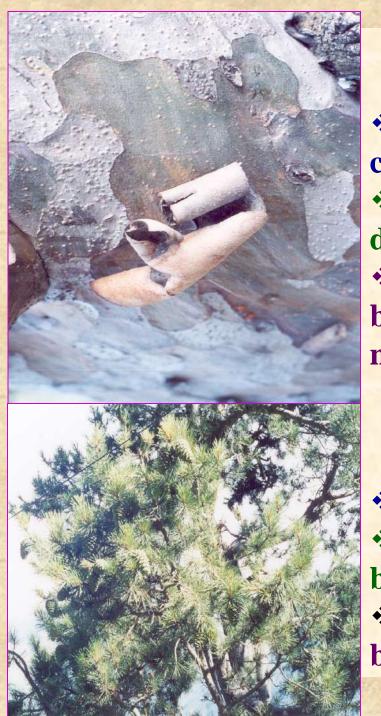
Soil

- Capable of growing on barren hillside with shallow soil
- Forms protective soil cover conserves soil
- Hardly any contribution to organic matter [less of needle fall + steep slope]

Habit

- Evergreen [3.5 dbh to 25 m height on maturity, spreading branches]
- Young trees profusely branched [not in whorls]compact, upward growth]
- Root system strong + penetrating





Bark

- ***** Easily distinguishable from other confers
- **Smooth**, , variegated , silvery grey to deep green becoming grey with age
- **❖** Peeled off in thin irregular, small, brittle, hard flakes leaving grayish green not much conspicuous depression

Branching

- Two types
- Shoots of unlimited growth with bud [scales]
- Shoots of limited growth [spurs / brachyblasts] with 3 needles



Leaves

- Scale leaves: smooth, prophyllus, light to deep brown, ovoid, pointed, fall after one year
- Needles: three in each spur [5 to 16 cm long], dark green, stiff, triangular in out line with some what rounded abaxial side, stomata 1 to 2 rows compactly arranged, white, 4 to 6 resin ducts, single fibrous vascular bundle, last for 3 years
- Basal sheath golden brown [0.8 to 1.3 cm long], fall in second year leaving triangular spur base

Buds

Terminal buds: non resinous, light to deep brown, ovoid, pointed, covered with lanceolate scales



Cones and

Same tree different branches

Cones

- Modified dwarf shoots, in clusters, on lower branches, on young shoots [0.9-1.3 cm long] Cylindrical
- Visible by end of spring or early summers
- Dehisce by longitudinal slits [June-July]

Female Cones

- Bearing age minimum 20 years, replace terminal buds on long shoots—modified long shoots, terminal, resinous, glaucous green
- I yr Erect, pollination in June-July, slight increase in size
- II yr Rapid increase in size, pendulous, full size by July, fleshy, Ripe by September/October [12-24 cm long, 7-14 cm dia], 70 to 100 scales
- Scales ovuleferous [2.5-5.0 cm long, 3.5 cm broad], exposed, obtusely triangular, dark coloured with stout umbo, tipped with recurved spine, bearing 2 seeds on upper surface in depressions and raised rims bearing of 4 types

Crop Bearing

- Bear bumper crop of cones each year, but seeds hollow
- Bear cones periodically and fruits quite sound
- Bear cones annually with good seed
- Bear bigger fruits



Seed



- Somewhat cylindrical and pointed at one end [1.5 to 2.5 cm long, 0.4 to 0.8 cm wide], with rudimentary wings
- Kernel in gradients [air dried]

1		
	Water	8.6%
	vvalt1	0.0 /0

- Fat/oil 49.9 to 51.3%
- > Starch/carbohydrates 21.5 to 22.5%
- > Proteins 15.9%
- Fibre 0.9 to 2.2%
- > Ash 3%
- > Average 25-30 cones for 1 kg of seeds

Maistura loss during drying traditional [24 50/1 salar [480/1 avan 530/1

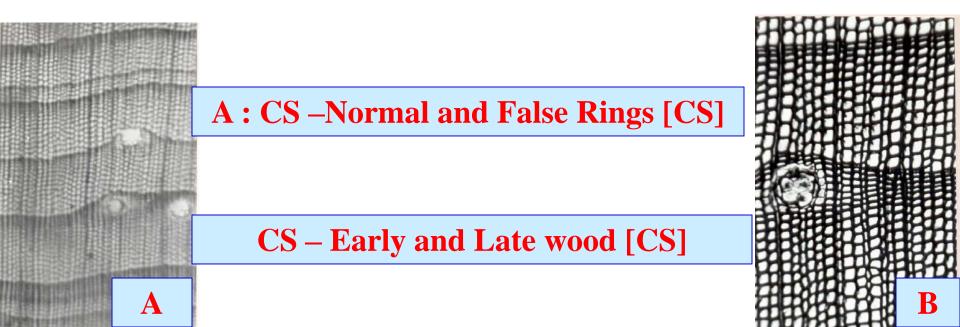


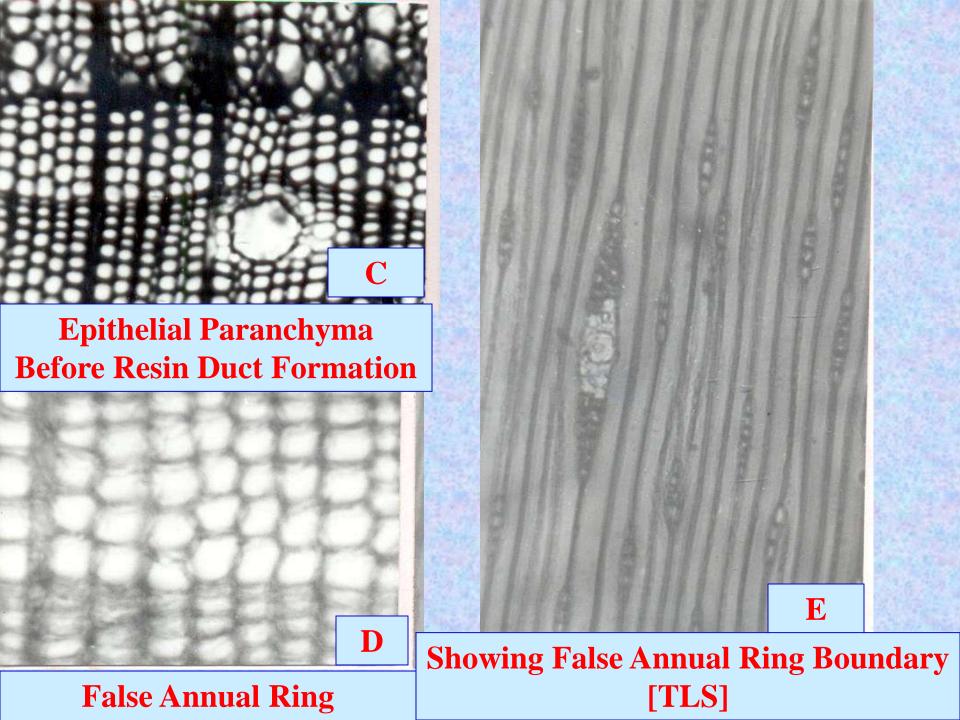
Wood

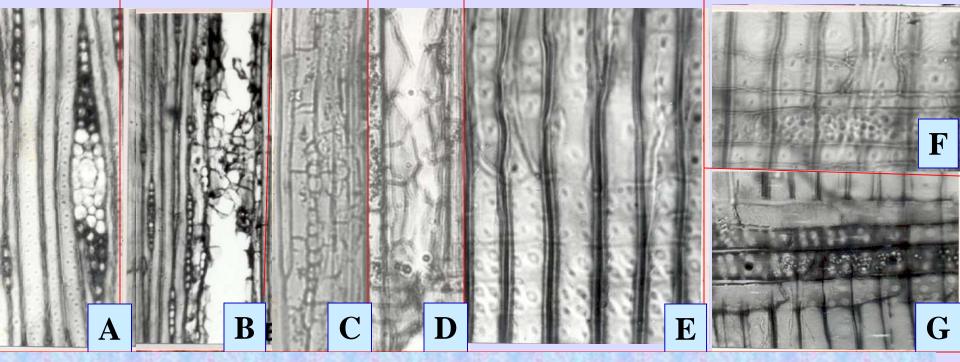
- Tough, durable, yellowish brown, resinous, heavier than other Indian conifers
- Annual rings [2-5/cm], conspicuous [2.5 cm], medullary rays narrow, resin ducts moderately large and scattered
- False rings also observed
- Compressed wood—common occurrence, under surface of branches or trunk of living leaning/fallen trees, formed in response to geotrophic stimuli, functionally counter acts force tending to deform tree

Wood

- False rings also observed
- Compressed wood common occurrence, under surface of branches or trunk of living leaning / fallen trees, formed in response to geotrophic stimuli, functionally counter acts the force tending to deform tree







- > A: Tangential bordering pitting on axial tradeids
- B: Longitudinal resin ducta
- > C: Epithelial paranchyma
- > D:Longitudinal resin ducts
- E-G: Heterogenous wood rays, pinoid pitting, bordered pits



Branching

Two Types

- Shoots of unlimited growth with apical buds
- Shoots of limited growth [Spurs / Brachyblasts] with 3 needles



Leaves

Scale leaves

Smooth, prophyllus, light to deep brown, ovoid, pointed, fall after one year,

Needles

Three in each spur [5-16 cm long], dark green, stiff, triangular in out line with some what rounded abaxial side





Basal sheath

Golden brown [0.8 to 1.3 cm long], fall in second year leaving triangular spur base



Buds

- > Terminal buds
- > Non-resinous
- > Light to deep brow
- Ovoid and pointed
- Covered with lanceolate scales

Cones

 \supseteq and \bigcirc : Same Tree Different Branches



cones

- ➤ Modified dwarf shoots, in clusters, on lower branches of young shoots, 0.9 to 1.3 cm long, cylindrical
- Visible by end of spring or early summers
- > Dehisce by longitudinal slits [June-July]

Cones





- Bearing age minimum 20 years
- Replace terminal buds on long shoots modified long shoots, terminal, resinous, glaucous green
- I yr erect, pollination in June-July, slight increase in size
- II yr rapid increase in size, pendulous, full size by July, fleshy, ripe by September/ October [12-24 cm long, 7-14 cm dia], 70 to 100 scales

Four Types of Bearing

- Bear bumper crop of cones each year, but most of the seeds hollow
- Bear cones periodically and fruits quite sound
- Bear cones annually with good seed
- Bear bigger fruits

Seed





Somewhat cylindrical and pointed at one end [1.5 to 2.5 cm long, 0.4 to 0.8 cm wide] with rudimentary wings

Ingredients

Water	8.6%
Fat/oil	49.9 to 51.3%
Starch/carbohydrates	21.5 to 22.5%
Proteins	15.9%
Fibre	0.9 to 2.2%
Ash	3%

- l. Average 25-30 cones for 1 kg of seeds
- 2. Moisture loss during drying traditional [24.5%], solar [48%], oven 53%]



Roots

- Deep rooted
- **Ectotrophic mycorrhizae** association [symbionts]
- * Rootlets slightly swollen, hairy towards tip due to setal hypae of fungal mantle
- Mature roots if exposed for longer periods attain bark appearance









Variation Studies

- ☐ To delineate the provenances for seed collection
- ☐ Phenotypic variations [12 localities]



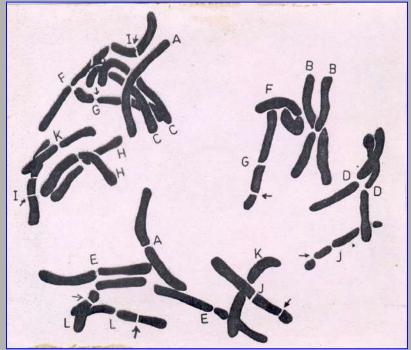
- Conical
- Slightly roundish [more cones]
- Round form





Needle colour

- **❖** Dark green − Kilba, Shongtong, Sharbo, Boktu, [better + more nuts/cone]
- Light green Jangi, Akpa, Ribba
- Yellow green Skibba, Moorang, Spillo, Kanam, Dubling
- Plus Trees Kilba, Shongtong, Sharbo, Boktu, Thopan, Raragn, Akpa, Jangi
- Wide range of variation Morphological characters
- ➤ High heritability + High genetic gain recorded for cone weight, cone size, nuts/cone, clear bole height, total tree height





Cytogenetics

- **❖** Somatic number as evident from root tips squashes shows 2N=24 chromosomes at metaphase
- Classified on basis of rindex [long / short arms]
- * Karyotype asymmetrical with longest pair 15.56 μm and smallest pair 10.85 μm in length
- ❖ Total chromatin length of diploidsomatic complement is 305.66µm





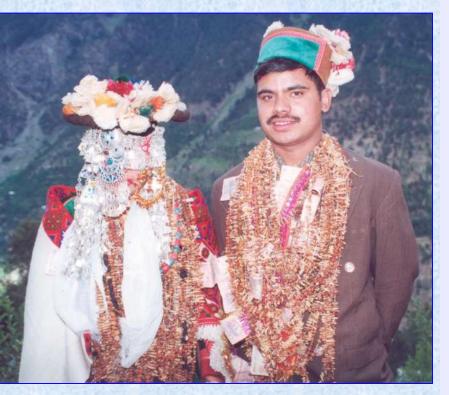


Cone Harvesting

- During September / October
- Manually
- Along with long shoots [1 to 3 ft]

Seed Extraction + Storage

- Cover cones with tarpaulin [10 to 25 days]
- Conserve heat
- Cone scales split on drying
- Cones cut into 2 to 4 parts
- Seeds extracted with hands by separating scales
- Damages skin + time consuming
- > Seeds store in wooden boxes, cloth bags

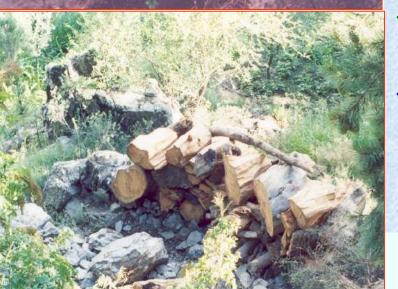




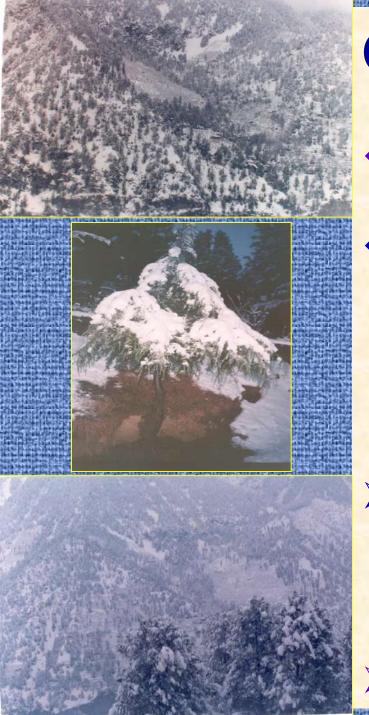
Uses-Traditional

- Only Indian conifer with edible seeds
- Delicate terebinthine flavour
- Seeds consumed raw or after roasting
- Food [seed + barley flour]
- Seed oil healing wounds
- Seeds steamed, cooled, deshelled for garlands [status symbol, marriages, welcome guests, social events]





- After delivery to women with other dry fruits
- ❖ Barter system exchange for rice + salt [1kg for 6kg rice] till 60's
- Excess sold in market [rs 300 to 450/kg in peo] for economic gains [poor families]
- Cone resin : plugging holes in wooden vesceles
- As torch wood during night
- Fuel wood : heart wood + cone as fire starter [kitchen, canadian stoves]
- Logs [resinous, water proof, almost immune to fungal attack] poles, drains in water channels



Other Uses

- Medicine, Anodyne, Stimulant, Carminative, Expectorant
- ❖ Tree resin [not extracted]: pale yellow, good quality, pinenene contents [70-80%]

Future Uses

- ➤ Value addition [Low volume high value products] blending with jams, sweets, chocolates, juices, sweet dishes, etc
- Forests for ecotourism

Problems Related To Natural Regeneration





- Very less of natural regeneration
- All cones harvested
- ***** Lopping of long branches
 - i. As not easy to reach inaccessible sites
 - ii. No modern technology + gadgets provided
 - iii. Disturbs crown/canopy
 - iv. Skews growth behaviour
 - v. Eliminates one year old cones
 - vi. Eliminates terminal buds to bear ♂ cones
 - vii. Injury to branches [energy loss in healing + site for infection]
 - viii.Leftover seeds consumed by birds, rats, squirrels, insects

Natural Regeneration







- 1. 3 cones attacked by cone borers [Dioryctria abietella + Cateremna cedrella Fm: Pyralidae] even tunnels into branches
- 2. Seeds prone to fungal attack [Penicillium citrinum, Trichothecium roseum]
- 3. Occasional fires destroys seedlings + seeds + cones [graziers+hunters]
- 4. Urbanization + developmental projects [mechanical damage, blastings disturbe soil profile]
- 5. Early drought [march may] kills seedlings
- 6. Young seedlings susceptible to insect + pathogen attack
- 7. Grazed + trampled

Other Problems



Trade

- 1Major supply from Baluchistan and Afghanistan
- 2Before Independence market price low
- 1Kinnaur neoza had less economic value
- 2No proper roads for transportation
- 31958 Rampur Lavi Rs 2.70/kg [Rs 100/maund]
- 41963 Rs 7/kg, 1965 Rs 8.50/kg 1973
 Rs 35/kg
- 5Barter 1kg neoza for 16 kg rice or utensils

Artificial Regeneration

- > 1839 Lord Auckland Introduced in England = Failure
- > Beginning of II Five Year Plan [Welfare Department]
- > 5 acers fenced uf 134(b) Kilba range, ufc 167 Kailash range, Roghi c 247, Boktu c238, c 240 (a), Kalpa c 227.
- Sowing [autumn + spring]
- In patches [2'x2'], in pits [1'x1'x1' along contours], broadcast [beneath boulders + bushes]
- > Success 50% [1st yr], complete death [2nd yr]

1958-59

- a) Containers [well prepared soil, watering, protection, shade]
- b) Betula bark [6-9" x 4"]
- c) Earthen tubes [10" long, top dia 5", basal dia 3"]
- d) Tin tubes [10"x6", 18" x 6"]
- e) 1959 polythene tubes [18" x 6"]: 1st yr 90%, 2nd yr 50%, 3rd yr 35%

Removing polybags at transplanting

- a] cutting bottom + removing both sides
- b] treatment a + window 1 x 20 cm
- c] cutting 2 cm from base + removing base
- d] c + window 2 x 20 cm
- e] incision on bag + bottom intact
- best cutting bag along bottom + folding upwards





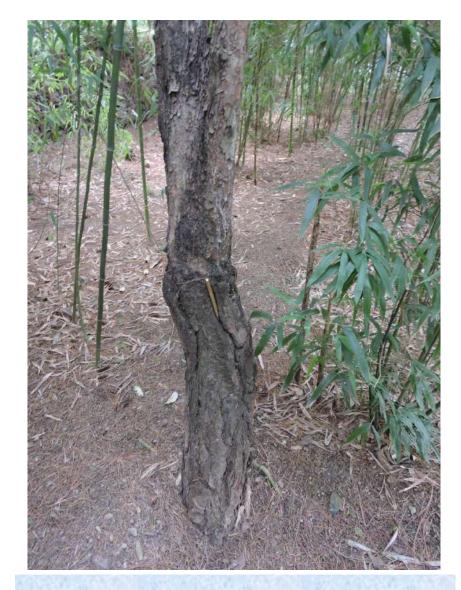
Grafting 1962 – 1967

- 1. Heteroplastic [neoza on chil + kail] at Shilli, Theog
- 2. Techniques veneer and cleft
- 3. Shilly 1962 to 1967 [cleft + veneer] = 3 to 88%
- 4. Presently 3 grafted trees
- 5. Kinnaur / theog [blue pine] 1963 to 1966 [cleft + veneer] = 0 to 14%

Shilley Nursery June20, 2018



The Secondlast



The Last

Forking



Graft union











Sharboo Kinnaur

A:

Surviving grafted plants

B:

Male + Female Cones
C:

First year female cones after pollination D:

Mature female cone first year cones

Air Layering

- 1973 Shilly and Skibba = 5 to 10%Presently no plants
- Sharbo 1998-2001Total failure



Sharbo + Holdoo, Kinnaur 1997-1999 Different Homoplastic Grafts = Only 10%Success





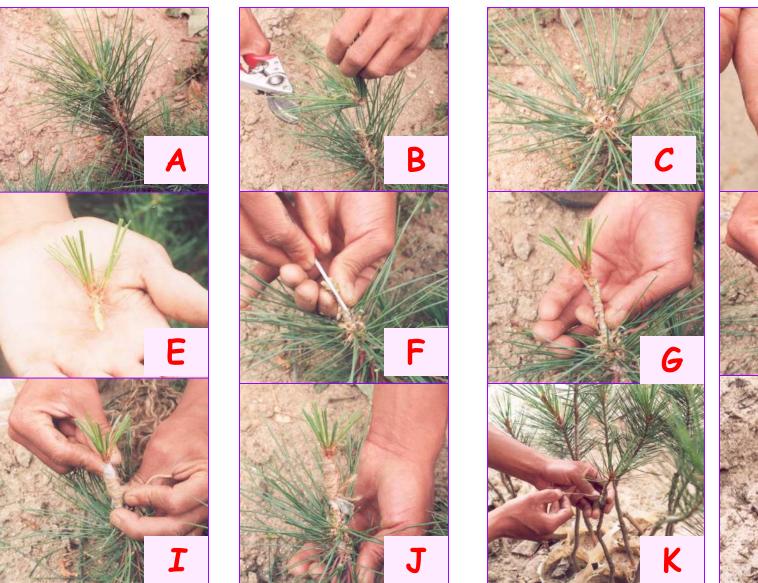








Sharbo 2000 Standardized Homoplastic Top Bud Cleft Grafting = 75%Success





Field Plantation

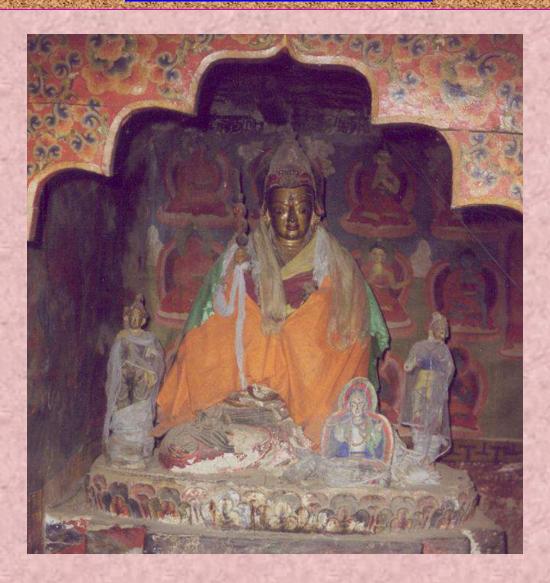








Thank You



Assessment and distribution of *Pinus gerardaiana*Wall. and other Important Wild Mushrooms using Geospatial Technology

Dr. Sarnam Singh

Senior Fellow, Wildlife Institute of India, MoEF&CC

Frmr Director CSSTEAP (Affil. To United Nations)
Frmr Dean (Academics) and Group Director ER&SSG
IIRS, ISRO



FOREST IN FOREST RESEARCH INSTITUTE CAMPUS



Data Choice - Objective based

Local level: Landsat-series, SPOT, IRS-LISS III, ASTER

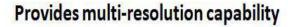
Micro-level: SPOT (MLX, PAN), IRS LISS IV, IKONOS,

CARTOSAT 1, 2, QuickBird, Worldview, etc.

Sentinel 2 data (10 m) Freely avaialbale

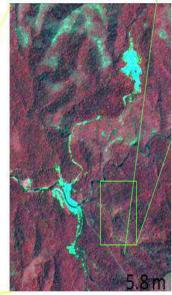
IRS series of Satellites

CARTOSAT

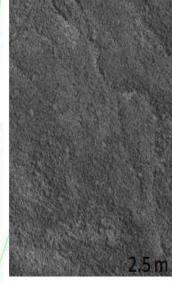


Effectively adopted in several National and Local initiatives

LISS III



LISS IV MX

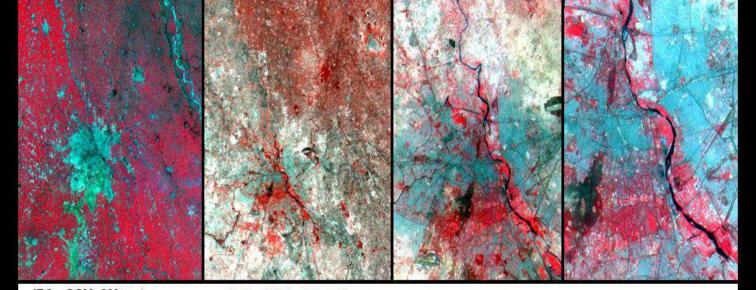


AWIFS



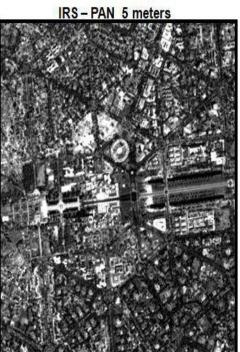


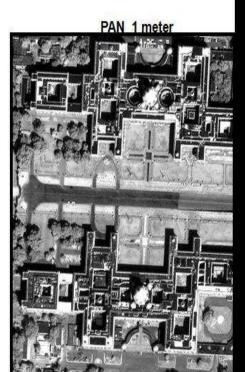
Enhanced spatial resolution enables delineation of species formations and individual trees



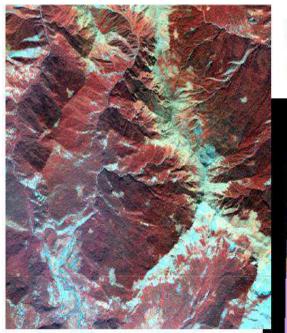
IRS - OCM 360 meters IRS - WIFS 188 meters IRS - LISS-I 76 meters IRS - LISS-II 36 meters
IMPROVEMENTS IN SPATIAL AND SPECTRAL RESOLUTIONS OF IRS SENSORS
DELHI AND ENVIRONS



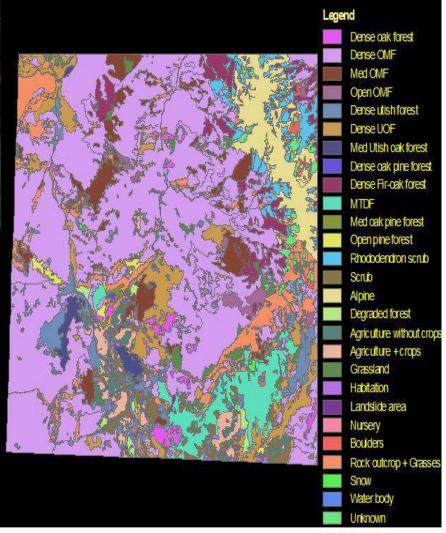




QuickBird data covering fringe area of Kedarnath WLS



LULC map of the fringe area of Kedarnath WLS using QuickBird data

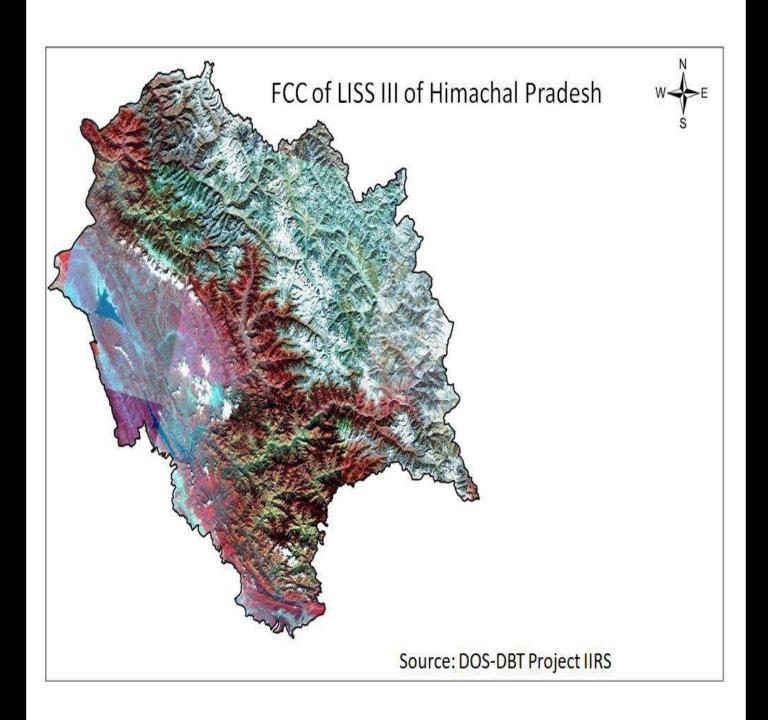


Probable Requirements

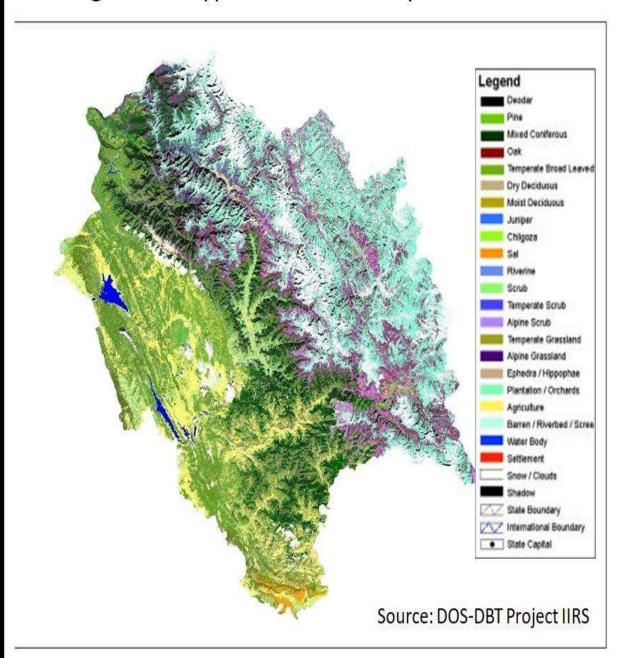
- Mapping on 1:5K or 1:10K using High /Very Resolution Multispectral/Hyperspectral satellite data (LISS IV, IKONOS, World View, Sentinel, etc.)
- Coverage/area of *Pinus geraradiana* Wall. density, site quality, soil, etc.
- Feasibility and Prioritization of mushrooms potential and targeted spp.
- Forest type-wise/Ecosystem-wise/Community-wise occurrence and geotagging of mushrooms.

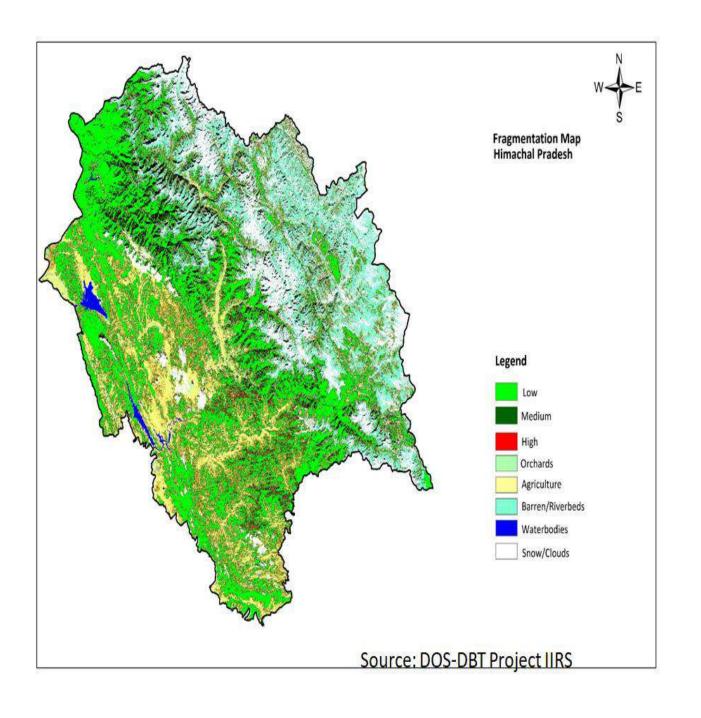
Probable Requirements

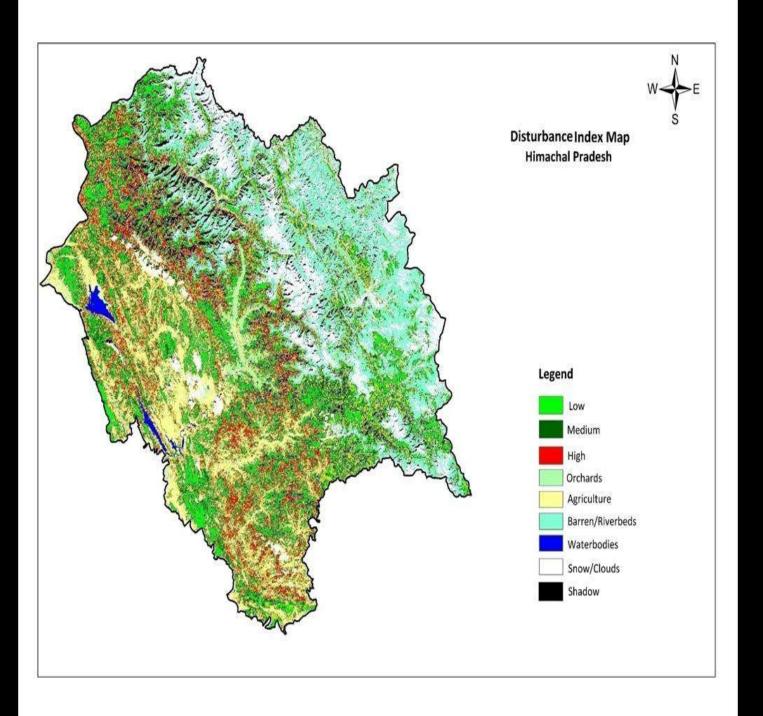
- Seasonality of mushrooms and micro-climatic/altitudinal zonation for round the year availability and harvesting, e.g. Putt (Sal Forest), Guchhi (Subtropical/temperate),
- Characterization of habitats for target species using EO-Ground data-Climatic data in GIS domain.
- Biotechnological intervention / protocols

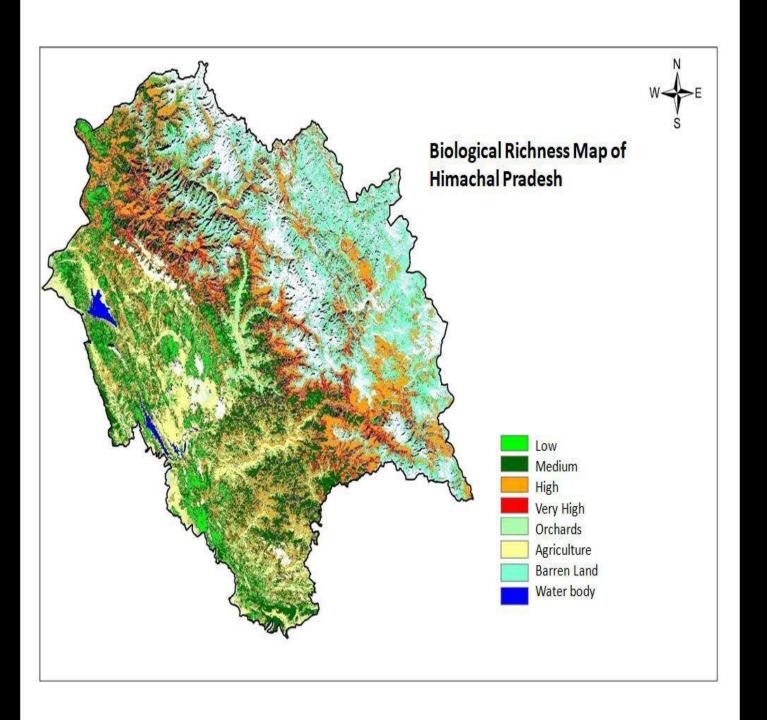


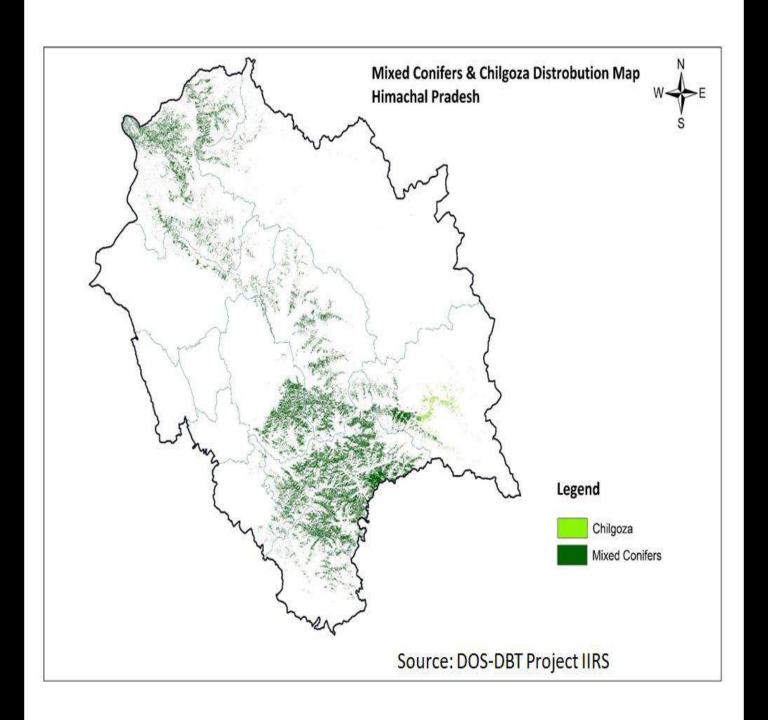
Vegetation Types and LULC Map of Himachal Pradesh



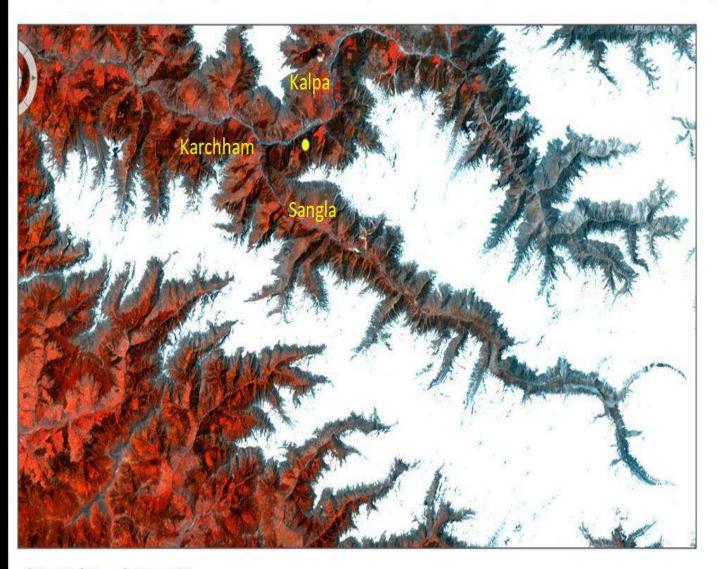






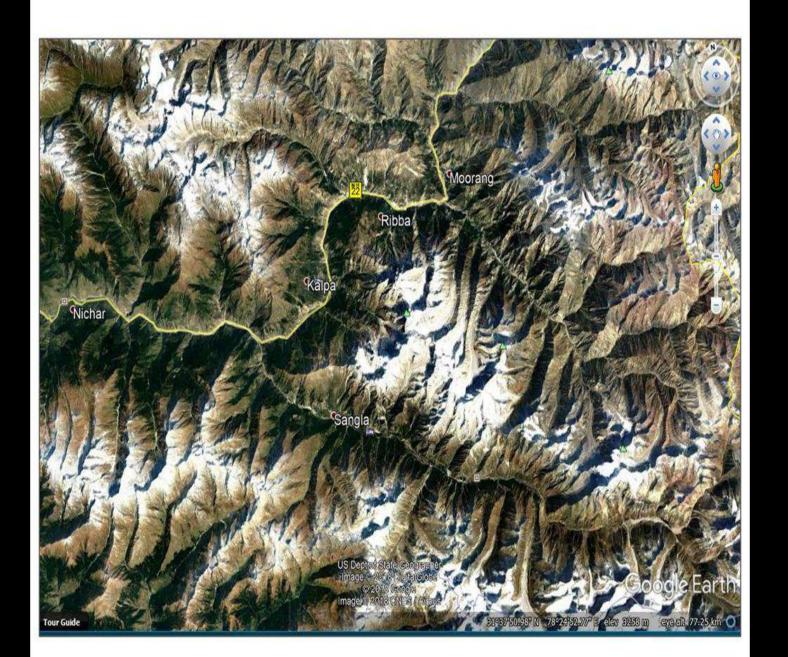


FCC (RGB:8,5,4) Image of Sentinal 2 (20/05/2018) of Kinnaur District (HP)



^{*}Spatial Resolution: 10m

Google Earth Image of Kinnaur District, Himachal Pradesh



Important Edible Wild Mushrooms of Kinnaur District (Himachal Pradesh)

Serial No.	Botanical Name	Local Name	Family
1	Agaricus campestris Linn.	Kammu, Khorpotey, Shong	Agaricaceae
2	Gyromitra sp	Chianjuh	Discinaceae
3	Helvella compressa (Synder) N.S. Weber	Aayokan, Maein	Helvellaceae
4	Hygrophorus sp	Rachela	Hygrophoraceae
5	Lactarius deliciosus (L. ex Fr.) S.F. Gray	Chanmoo, Jadmoh, Migang	Russulaceae
6	Lycoperdon sp Pers	Lalari, Lalrishal	Lycoperdaceae
7	Morchella conica Pers. Ex. Fr	Gopal, guchhi	Morchellaceae
8	Morchella deliciosa Fries	Gopal, guchhi	Morchellaceae
9	Morchella esculenta Fr.	Chlango, Guchhi Jamoo, Shaime	Morchellaceae
10	Ramaria botrytis (Pers. Fr.) Ricken	Mooh	Gomphaceae
11	Rhizopogon vulgaris (Vittad) M. Lange	Khorpatey, Migang	Rhizopogonaceae
12	Sparassis crispa Fr.	Aayokan, Kathmooh, Mohin, MoohchoSho	Sparassidaceae

^{*}Chauhan, Joginder, et al. "Wild edible macro-fungi-A source of supplementary food in Kinnaur District, Himachal Pradesh, India." *Journal of Medicinal Plants* 2.1 (2014).

Thanks for your attention

sarnam.singh@gmail.com, sarnam@wii.gov.in



	Registration List for Launch Workshop		
Sr. No.	Name& Address	Email	Phone
1.	A.K. Bhatt	arvind.bhatt@hpuniv.ac.in	9418450009
1.	Department of Biotechnology	arvina.onact@npunrv.ac.m	9410430009
	HP University, Summer Hill, Shimla -171005(HP)		
2.	Anil Kant Thakur	anil.thakur@juit.ac.in	7018034279
2.	Associate Professor	anilkantv@gmail.com	9816305931
	J UI T Waknaghat, Solan PIN-173234		7010202721
3.	Ashok Kumar	ashokumar59@yahoo.com	094180 69336
	Pr. Scientist Shivalik Agricultural Research and		
	Extension Centre, Kangra-176001, HP		
4.	Avneet Pal Singh	avneetbot@gmail.com	095010-36143
	Department of Botany, Punjabi University	8	
	Patiala 147002, Punjab		
5.	Brijesh Sakalani	bsaklani@gmail.com	9418470192
	AGiSAC, Paryawaran Bhawan Bemloe, Shimla-		
	171001(H.P.)		
6.	Dharmesh Gupta	dkguhf@rediffmail.com	09418030489
	Department of Plant Pathology		
	College of Horticulture Dr YS Parmar University of		
	Horticulture and Forestry, NauniSolan(HP) 173230		
7.	Duni Chand	duni.chand@hpuniv.ac.in	94182 76448
	Department of Biotechnology		
	HP University, Summer Hill, Shimla -171005 HP		
0	HDG 11 D: : 1G:	11 1 6 7	0005265422
8.	H.P. Sankhyan, Principal Scientist	sankhyanhp@gmail.com	9805365433
	Department of Tree Improvement & Genetic		
	Resources, College of Forestry		
	Dr YS Parmar University of Horticulture and		
9.	Forestry, Nauni Solan(HP) 173230 J.R. Sharma	ing 010@madiffmail.com	87553 57836
9.	Scientist 'E' & Joint Director (Retired)	jrs_010@rediffmail.com Jairamsharma010@gmail.com	8/333 3/830
	Botanical Survey of India, Northern Regional	Janamsharmao 10 @ gman.com	
	Centre, 192Kaulagarh Road, Dehradun–248195,		
	Uttarakhand		
10.	Joginder Kumar	jkumar.nz@gmail.com	9418231806
10.	FSI Shimla	JKumar.nz@gman.com	7410231000
11.	K. S. Pant, Professor	pantks_@rediffmail.com	9418147790
11.	Department of Silviculture& Agroforestry,	paneno_e realimanteoni	7110117770
	College of Forestry Dr YS Parmar University of		
	Horticulture and Forestry, Nauni Solan(HP) 173230		
12.	Kallol Kumar Pramanick	kallolparmanick@gmail.com	0177-2808766
_•	Head, Principal Scientist	head_shimla@iari.res.in	
	ICAR Regional Station Amartara Cottage, Shimla		
13.	Krishan Chand	Krishan.hpushimla@gmail.com	9882008715
_ •	AGiSAC, Paryawaran Bhawan Bemloe, Shimla-		
	171001(H.P.)		

1.4	I al Cinah	lalbra@amail.com	00160 26020
14.	Lal Singh	lalhrg@gmail.com	98160 26820
	Himalayan Research Group (HRG), Umesh Bhawan Chotta Shimla-171002 HP		
15.		ambayaath@radiffmail.aam	9418311557
13.	M.K. Seth, Professor (Retd.)	emkayseth@rediffmail.com	9418311337
	Department of Biosciences,		
	Himachal Pradesh University,Summer Hill,Shimla (H.P.)		
16	` '	mandaanha@amail.aam	8859701556
16.	Mandeep Kaur	mandeephp@gmail.com	8839/01330
	Department of Forestry Delphin Institute of Pic Medical and Natural		
	Dolphin Institute of Bio Medical and Natural		
	Sciences Manduvala, Near Suddowala, Chakrata		
17	Road Dehradun-248007 UK	· 1 · 1 @ 1'.00 · 1	00160 22500
17.	Maninder Jeet Kaur	maninderjk@rediffmail.com	98160 22599
	Himalayan Research Group (HRG), Umesh		
	Bhawan		
10	Chotta Shimla-171002 HP		04105.05500
18.	Manisha Thapliyal, Scientist-F	thapliyalm@icfre.org	94105 05639
	Silviculture Division Forest Research Institute		
- 10	(FRI) PO New Forest, Dehradun-248006 UK		004 4000 74
19.	Mukesh Prabhakar, Asstt. Professor,	mukeprabhakar1@gmail.com	9816222354
	Department of Silviculture & Agroforestry,		
	College of Forestry YSPUHF-Nauni Solan 173230		
20.	Munruchi Kaur	munruchi@gmail.com	099881-95434
	Department of Botany, Punjabi University		
	Patiala 147002, Punjab		
21.	N.S. Attri	narinderatri04@yahoo.com	94178-10754
	Department of Botany, Punjabi University		
	Patiala 147002, Punjab		
22.	N.S.K. Harsh	nirmalharsh57@gmail.com	97581 01148
	Forest Pathology Division		
	Forest Research Institute (FRI)		
	PO New Forest, Dehradun-248006 UK		
23.	Narendra Kumar Pandey	nkpcpri@gmail.com	94182- 76362
	Division of Social Sciences,		
	Milsington Estate, CPRI, Shimla, HP		
24.	Nav Bahar, Scientist-D	baharn@icfre.org	7579090570
	Silviculture Division		
	Forest Research Institute (FRI)		
	PO New Forest, Dehradun-248006 UK		
25.	Ombir Singh, Scientist-E	ombirfri@gmail.com	9410150537
	Silviculture Division		
	Forest Research Institute (FRI)		
	PO New Forest, Dehradun-248006 UK		<u> </u>
26.	R.S. Chandel,	rs_c@rediffmail.com	94181 08630
	Executive Director, Zero Budget National Farmer		
	Department of agricultural, Govt. of HP		
27.	Rajan Bawa, Professor (Retd)	rbawauhf@yahoo.co.in	9418003030
	YS Parmar University of Horticulture & Forestry		
	Nauni, Near Sainik Rest House,		
	Solan, H.P. 173 212		
		I	1

28.	Rakesh Kanwar	ruraldevdir-hp@nic.in	0177-2624792
20.	Director (RD&PR)	Turaidevan-np@mc.m	0177-2623820
	Rural Development Department 27 SDA Complex,		0177-2023620
	Kasumpti Shimla-171009		
29.	Ravinder Sharma, Professor		9418148202
29.		mah a mar ayılı f @ yyalı a a a a i m	9418148202
	Department of Social Sciences	rsharmauhf@yahoo.co.in	
	College of Forestry Dr YS Parmar University of		
20	Horticulture and Forestry, Nauni Solan(HP) 173230	1 66.0	0.410.4020.60
30.	Rohit Chauhan	rohituprofft@gmail.com	9418482869
	AGiSAC, Paryawaran Bhawan Bemloe, Shimla-01		
31.	Sandeep Sharma, Scientist-G	sharmas@icfre.org	94181 64067
	Himalayan Forest Research Institute (HFRI)		
	Conifer Campus, Panthaghati Shimla 171013 HP		
32.	Santosh Watpade	santoshpathology@gmail.com	9805325107
	Indian Agricultural Research Institute,		
	Regional Station (CHC), Amartara Cottage,		
	Shimla -171004		
33.	Sarnaam Singh	Sarnaam.singh@gmail.com	9411767197
	Scientist/Engineer- G, Dean (Academics)		
	Indian Institute of Remote Sensing, ISRO, Dept. of		
	Space, Govt. of India, 4 Kalidas Road, Dehradun –		
	248001, Uttarakhand		
34.	Saurabh Kulshrestha	saurabhkulshrestha@shooliniu	9625033405
0	Shoolini University of Biotechnology and	niversity.com	3020000100
	Management Sciences Solan-173212 (H.P.)	m versity.eem	
35.	Shahsi Kumar Sharma		+91 1786
33.	Associate Director (R&E) and Head	Email:adrsharbo@gmail.com	222231
	Regional Horticultural Research & Training Station	shashi_uhf@yahoo.com	94180-75449
	and KVK, Sharbo, Kinnaur 172 107 (HP)	shashi_um @ yanoo.com	74100-75447
36.	Shailendra Kumar	sksbpipil@gmail.com	94101 02149
50.	Directorate of Research, ICFRE	sksopipii@giiaii.com	74101 02147
	P.O. New Forest, Dehradun-248006 UK		
37.	Shyam Kumar Masakapalli	shyam@iitmandi.ac.in	
37.	• • • • • • • • • • • • • • • • • • •	snyam@nunandr.ac.m	
	Indian Institute of Technology Mandi, Kamand		
20	Campus, Mandi-175005	Jacobba da barrara (C. 17	0017040002
38.	Subhash Sharma, Assistant Professor	dsubhashsharma@gmail.com	9817049803
	Department of Social Sciences		
	College of Forestry Dr YS Parmar University of		
	Horticulture and Forestry, Nauni Solan-173230		
39.	Sudhir Kumar	syalsudhir@gmail,com	
	Department of Bio-technology & Bioinformatics,		
		1	
	Jaypee University of Information Technology		
	Jaypee University of Information Technology Waknaghat, Solan-173234		
40.	Jaypee University of Information Technology Waknaghat, Solan-173234 Suresh Chandra	sureshfri982@gmail.com	75794 88083
40.	Jaypee University of Information Technology Waknaghat, Solan-173234	sureshfri982@gmail.com	75794 88083
40.	Jaypee University of Information Technology Waknaghat, Solan-173234 Suresh Chandra	sureshfri982@gmail.com	75794 88083
40.	Jaypee University of Information Technology Waknaghat, Solan-173234 Suresh Chandra Forest Pathology Division	sureshfri982@gmail.com	75794 88083
40.	Jaypee University of Information Technology Waknaghat, Solan-173234 Suresh Chandra Forest Pathology Division Forest Research Institute (FRI)	, and the second	75794 88083 94180 43669
	Jaypee University of Information Technology Waknaghat, Solan-173234 Suresh Chandra Forest Pathology Division Forest Research Institute (FRI) PO New Forest, Dehradun-248006 UK	sureshfri982@gmail.com Surrender.sharma01@gmail.co m	

42.	Swaran Lata, Scientist-C	latas@icfre.org	9816590718
	Silviculture and Forest Management Division		
	Himalayan Forest Research Institute (HFRI)		
	Conifer Campus, Panthaghati Shimla 171013 HP		
43.	T.N. Lakhanpal	tezlakhanpal@rediffmail.com	94180 60641
	Sai Tara Ashrya, Sargheen Panthaghati		
	Shimla – 171013 HP		
44.	Vinod Kumar Bhatt		8191802086
	Executive Director, NAVDANYA, 105, Rajpur	vinodkbhatt@gmail.com	
	Road Dehradun- 28001 (Uttarakhand)		
45.	Y.P. Sharma	yashdbm3@yahoo.co.in	09419157412
	Professor (Former Head) and UGC-SAP II		
	Coordinator Department of Botany, University of		
	Jammu, (J&K), India		
46.	Y.P. Sharma (Retired)	yashiarishimla@gmail.com	94180 06302
	HIMCOSTE, Shimla		
47.	Yash Pal Sharma,	yashuhf@gmail.com	9418148114
	Principal Scientist Department of Forest Products,		
	College of Forestry Dr YS Parmar University of		
	Horticulture and Forestry, NauniSolan(HP) 173230		
48.	Dr. Nitin Verma		97364190133
	Baddi University		

Registration List for Launch Workshop of Chilgoza and Wild Mushroom Administrators

Sr No	Name& Address	Email	Phone
1.	Ajay Kumar IFS		9410110795
	PCCF (Fin)		177-2624289
	H. P. Forest Department Talland, Shimla		
2.	Angel Chauhan, HFS	dfokin-hp@nic.in	9418034414
	Divisional Forest Officer		
	Reckong Peo District-Kinnaur 172107		
3.	Anil Soni	aksoni31@gmail.com	9418455048
	ACF Kinnaur		
4.	Anil Thakur, IFS	Anil.thakur.ifs@gmail.com	9418457800
	Chief Conservator of Forest		
	Rampur Circle District-Shimla-172001		
5.	B.D. Suyal	bd.suyal@gov.in	Tel: 0177
	Regional Director (North Zone)		26582850177
	Forest Survey of India, Longwood, Shimla		2655572
6.	Lal Singh	lalsinghbilyan64@gmail.com	9418023766
	Range Forest Officer Moorang, Kinnaur		0177 00 (2200
7.	Mohainder Singh Rana	horticul-hp@nic.in	0177-2842390
	Director Directorate of Horticulture,		
0	Himachal Pradesh, Navh Bahar, Shimla-1		7.500,000.00
8.	Neik Chand,		76509-09860
	Forest Range Officer, Killar		FAX: 01897-
	V.P.O. Killar Tehsil-Pangi Distt. Chamba		242247
9.	(H.P.) – 176323 O.P. Solanki	ccfcha-hp@nic.in	01899-222237
<i>)</i> .	Chief Conservator of Forest	cerena-np@me.m	Fax:01899225
	Chamba District Chamba 176314, (H.P.)		839
	Chamba District Chamba 170311, (11111)		9418485544
10.	Parveen kumar	Pknegi111@gmail.com	7 110 1000 11
	Pradhan Gram Panchyat Kalpa, Kinnaur		
11.	Raj Bahadur, Forest Range Officer - Pooh		9459052305
	C/o Divisional Forest Officer, Reckong-Peo		
	Distt. Kinnaur – 172107		
12.	Rakesh Kanwar	:ruraldevdir-hp@nic.in	0177-2624792
	Director (RD&PR)	_	0177-2623820
	Rural Development Department 27 SDA		
	Complex, Kasumpti Shimla-171009		
13.	Kailash chand R.O.	ashok.sharma352@gmail.com	8894901962
	Forest Range Officer, Bharmour		
	RanDistt. Chamba (H.P.)- 176315		
14.	S. P. Negi IFS	spn_ifs119@yahoo.com	
	Head Extension division, HFRI Shimla		
15.	Shiv Nath Sharma		01897242247
	Block Officer		
	Killar, Pangi, Distt Chamba HP-176323		

16.	Sunil Chandra	ddsm@fsi.nic.in	6395029921
	Deputy Director (SM)	dgfsi@fsi.nic.in	9456169940
	Forest Survey of India, Dehradun (UK)-	-	
	248195		
17.	Tarun Kapoor (IAS 87)	envsecy-hp@nic.in	2621586
	Addl. Chief Secy. Env., Sci. & Technology		2880703
	govt. of HP		
18.	V.P. Twari	vptewari@icfre.org	9418422769
	Director Himalayan Forest Research Institute	dir_hfri@icfre.org	
	(HFRI) Conifer Campus, Panthaghati Shimla		
	171013 HP		
19.	Vinod Rajta		9816339595
•	Range Forest Officer, Kalpa Kinnaur		0.1101.101.10
20.	S.S. Kataik, IFS	sskataikifs@gmail.com	9418142143
21	Director (South), HPSFDC	10041 11:0	00.60.402.502
21.	Deepak Pandey	1234delhi@gmail.com	9868402503
22	Commandant ITBP, Taradevi Shimla	110 1	0410005210
22.	Karam Chand Azad	karamchandazad@gmail,com	9418095319
23.	Joint Director, Horticulture Navbhar Shimla P.R. verma	anne al-Qamail aan	0419127076
23.		apmc.sk@gmail.com	9418137076
24.	APMC marketing board Rajender Bhardwaj		9418140787
<i>2</i> 4.	Senior Marketing Officer		9410140707
25.	Dr. Soemsh Sharma	someshsharma@shooliniuniver	
23.	Shoolini university	sity.com	
26.	Sher singh	Sity.com	9805221787
20.	Pradhan Purvani		7003221707
27.	Shiv raj negi	shivr@gmail.com	9736252900
	Pradhan	8	
28.	Saurabh thakur	thakur.saurabh1990@gmail.co	8894025561
	AP Goyel university	m	
29.	Prem Ankoon	eo444@agu.edu.in	98050655577
	AP Goyel university		
30.	Ravinder kumar	Ravinder101990@live.com	9459764898
	AP Goyel university		
31.	Dr. Vaneet Jishtu	jishtu@yahoo.com	9418054070
	HFRI Shimla		
32.	Desh Raj Sharma	Krishi.bhawan-hp@nic.in	9418017145
	Director Agriculture		
33.	Sanjeev Sharma		9418026494
	DFO Chamba		
34.	Dr. J. Shankara Swamy	shankara.swamy@gmail.com	9626654439
35.	Dr. Sushma Sharma	Sushmasharma1987@gmail.co	8219229485
	Agriculture	m	
36.	Sapna Thakur	sapnabiotec@gmail.com	9459506118
	Biotechnology		

Registration List for Media

Sr. No	Name	Email	Phone
1.	Dev		
2.	Bhupinder Sharma		
3.	Rakesh Kumar		
4.	Manoj Kumar		
5.	Kuldeep Singh		
6.	Anil Kumar Sharma		
7.	Rajinder Kali		
8.	Satish Pal		
9.	Deepika Sharma		
10.	Sudershan kumar		
11.	Bhawana Negi		
12.	Meena Koundle		
13.	Reena Thakur		
14.	Prakhar		
I.	1	<u> </u>	I.

Registration List for Launch Workshop of Chilgoza and Wild Mushroom HIMCOSTE Team

~	T		T =
Sr.	Name and	Email	Contact No.
No.	address		
1.	Dr. Aparna Sharma	aparnansarin@gmail.com	9418472655
2.	Sh. Umesh Pathania	Pathaniaumesh65@gmail.com	7018514047
3.	Sh. Manoj Kaul	kaulmanoj7@gmail.com	9418941713
4.	Sh. Amit Rana	amitrana_neetu@rediffmail.com	9418800179
5.	Sh. Prem Lal		9418081465
6.	Mr. Brij Bhushan	brij.bhushan871@gmail.com	9459279129
7.	Ms. Archana Negi	archunegi05@gmail.com	8894919768
8.	Ms. Monika Chauhan	monikachauhan1654@gmail.com	9857193117
9.	Dinesh Kumar	dkc81288@gmail.com	
10.	Mrs. Poonam Dharma	poonamdharma777@gmail.com	8988073292
11.	Sh. Ajay Panwar	panwerajay09@gmail.com	7018067960
12.	Sh. Narender Kaushal		9805423577

13.	Ms. Jai	vermajaipriya06@gmail.com	9459826806
	Priya		
	Verma		
14.	Sh. Surinder		8091023677
	Singh		
15.	Sh. Arvind		8894266250
16.	Sh. Pritam		9418094377
17.	Sh. Roop		
	Ram		941800807
18.	Sh. Narayan		9418950417
	Dutt		
19.	Sh. Bija		9805437287
	Ram		

Registration List for Launch Workshop of Chilgoza and Wild Mushroom HFRI Team

Sr.	Name and address	Email	Contact No.
No.			
1.	Dr. Ashwani Tapwal	ashwanitapwal@gmail.com	9418065960
2.	Sh. Pitamber Singh Negi	psnegi12@yahoo.co.in	9418160802
3.	Dr. Pradeep Kumar	prad2epkumar@gmail.com	9459763511
4.	Ms. Neha Sharma		8894045919
5.	Mrs. Jagriti Sharma	Jagritigautam2@gmail.com	9418314655
6.	Ms. Anu Rani Sharma	cute.anu2189@gmail.com	7018747315

चिलगोजा और जंगली मशरूम के संरक्षण को चलेगा अभियान

शिमला। हिमाचल प्रदेश विज्ञान, प्रौद्योगिकी और पर्यावरण परिषद और हिमालयन वन अनुसंधान संस्थान ने चिलगोजा और जंगली मशरूम के संरक्षण के लिए मिलकर काम शुरू किया है।

शनिवार को दोनों संस्थाओं ने संयुक्त जागरूकता व संरक्षण की शुरुआत अभियान कार्यक्रम में शासन के अधिकारियों के अलावा कई वैज्ञानिकों ने अपने प्रस्तुतिकरण दिए। परिषद के सचिव कुणाल सत्यार्थी ने बताया कि दोनों संस्थाएं दोनों प्रजातियों को बचाने के प्रोजेक्ट को तीन साल की अवधि में करीब 1.96 करोड़ रुपये में पूरा करेंगे। अध्ययन का लक्ष्य किसानों की आजीविका पीढ़ी में वैज्ञानिक हस्तक्षेपों से सुधार करने के लिए और जंगली मशरूम में सुधार पर कई अध्ययन करना है। यह किन्नौर जिले में सतल्ज घाटी, चंबा जिले के पांगी और भरमौर में समुद्र तल से 1800 से 3350 मीटर के बीच की ऊंचाई पर होता है। ब्यूरो

पहल

चिलगोजा और जंगली मशरूम पर शुरू हुआ सरंक्षण का कार्य

हिमाचल में मिलीं मशरूम की 55 प्रजातियां

हिमाचल दस्तक ब्यूरो। शिमला

हिमाचल के विभिन्न क्षेत्रों से जंगली मशरूम की 55 प्रजातियां मिली हैं। इन मशरूम को जांच के लिए हिमालयन फॉरेस्ट रिसर्च इंस्टीट्यूट की लैंब में भेज दिया गया है। जांच के बाद पता लगेगा कि इसमें कितने मशरूम जहरीले हैं और कितने खाने योग्य हैं।

बता दें कि प्रदेश में चिलगोजा और जंगली मशरूम के संरक्षण के प्रोजेक्ट

पर काम शुरू हो गया है। इस पर आधारित कार्यशाला का आयोजन शनिवार को शिमला के होली-डे होम में किया गया है। कार्यक्रम में प्रोजेक्ट



को सफल बनाने पर चर्चा की गई है।

इसमें मुख्यातिथि हिमकोस्ट के अध्यक्ष और अतिरिक्त मख्य

सचिव पर्यावरण विज्ञान एवं प्रौद्योगिकी विभाग तरुण कपूर रहे। कार्यक्रम में हिमकोस्ट के सचिव कुनाल सत्यार्थी ने कहा कि हिमाचल प्रदेश में चिलगोजा

और जंगली मशरूम में वैज्ञानिक हस्तक्षेपों के माध्यम से आजीविका उत्पादन में सुधार पर अध्ययन परियोजना को सरकार द्वारा मंज्रुरी दे दी गई है। इस परियोजना को तीन साल की अवधि में पुरा किया जाएगा। इस परियोजना की कुल लागत 1.96 करोड रुपये है। जानकारी के मृताबिक इस अध्ययन का लक्ष्य स्थानीय किसानों की आजीविका में वैज्ञानिक हस्तक्षेपों के माध्यम से सधार में लाना तय किया गया है। चिलगोजा के बीज को स्थानीय लोग नियोजा के नाम से बेचते हैं, जिसे सखे फल के रूप में खाया जाता है। इसमें तेल, स्टार्च, प्रोटीन और एल्बिनोइड्स प्रचर मात्रा में होता है। कार्यक्रम में चर्चा की गई कि

चिलगोजा संरक्षण के लिए तैयार की जाएगी नर्सरी

विलगोजा पाइन का रोपण बढाने के लिए एचपी वन विभाग के सहयोग से एक नर्सरी भी स्थापित की जा रही है। विशेषज्ञों के मुताबिक कई जैविक और अजैविक कारकों के कारण चिलगोजा पाइन का प्राकृतिक पुनर्जन्म बहुत कम है। लिहाजा इसका संरक्षण जरूरी है।

विलुप्तप्राय वाली श्रेणी में चिलगोजा और मशरूम को सूचीबद्ध किया है। इसके संरक्षण के लिए उपयुक्त रणनीतियों के विकास, बीज परिपक्षता सूचकांक के बारे में विस्तृत अध्ययन किया जाएगा।

HP starts work to save Chilgoza and wild mushrooms

SHIMLA: The Himachal Pradesh Council for Science, Technology and Environment and Himalayan Forest Research Institute will be working together on conservation of Chilgoza and wild mushrooms in Himachal Pradesh. In order to start the project a one day workshop of the stakeholders has been organised here on Saturday.

Tarun Kapoor, Chairperson HIMCOSTE-cum-Addl Chief Secretary has called upon participants to save the Chilgoza and wild mushroom species which are on the verge of extinction. This was disclosed by Kunal Saty-

arthi, Member Secretary (EC) of

the HIMCOSTE on Friday. He

said that a project worth Rs 1.96

Chilgoza in Afghanistan.

This pine is native to the NorthWestern Himalaya in eastern Afghanistan, Pakistan and northwest India. It is commonly found

crore on "Studies on improving livelihood generation through scientific interventions in Pinus gerardiana (Wall) and important wild mushrooms in Himachal Pradesh" has been sanctioned jointly to the two institutes for a period of three years by Department of Science and Technology Govt of India.

Pinus gerardiana (Wall) is commonly known as Chilgoza or Neoza Pine in Hindi, Ree in Kinnaur, Miri in Chamba and Chiri or Galboza, Kashti in Kashmir and Chilgoza in Afghanistan



above msl. Further, large variety

of edible and wild mushrooms is



chilgoza and white mushrooms.

in Sutlej valley in Kinnaur District,
Pangi and Bharmour in Chamba
district at 1800 to 3350 meters

found in the State. Gueca well known and highly antional and internation

found in the State. Gucchhi is very well known and highly priced in national and international market for its taste and medicinal properties. DP

जानकारी हिमकोस्ट और हिमालयन वन अनुसंधान संस्थान मिलकर काम करेंगे

चिलगोजा, मशरूम दिलाएगा आजीविका

यानी एचएफआरआइ प्रदेश में

चिलगोजा और जंगली मशरूम के

यह बात अतिरिक्त मुख्य सचिव

वन तरुण कपुर ने शिमला में

प्रौद्योगिकी विभाग द्वारा मंजूरी दी गई

संरक्षण पर मिलकर काम करेंगे।

है। इस परियोजना को तीन साल की

अवधि में पुरा किया जाएगा, जिसके लिए 1.96 करोड़ रुपये मंजुर किए

हिमाचल प्रदेश में चिलगोजा

किन्नौर जिले में सतलूज घाटी,

के बीच की ऊंचाई पर होता है। कई जैविक और अजैविक कारकों के

स्टार्च, प्रोटीन और एल्बिनोइड्स से

चंबा जिले के पांगी और भरमौर में आयोजित कार्यशाला के दौरान कही। चिलगोजा और जंगली मशरूम समुद्र तल से 1800 से 3350 मीटर का वैज्ञानिक तरीके से प्रयोग कर आजीविका उत्पादन में सुधार किया जाएगा। इस पर अध्ययन व कार्य के कारण चिलगोजा पाइन का प्राकृतिक लिए तैयार परियोजना को विज्ञान और पुनर्जन्म बहुत कम है। यह तेल,

मुल्यवान है। जहरीले और औषधीय मशरूम की पहचान करने के लिए पारंपरिक ज्ञान का उपयोग करते हैं। भविष्य में खेती कार्यक्रमों के लिए संभावित मशरूम प्रजातियों की पहचान की जाएगी।क्षेत्र के काम के दौरान प्रारंभिक शोध कार्य करने के लिए रिकांगपिओ में एक अस्थायी शोध केंद्र स्थापित किया जा रहा है। इसके अतिरिक्त चिलगोजा पाइन के रोपण बढाने के लिए प्रदेश वन विभाग के सहयोग से एक नर्सरी भी स्थापित

की जा रही है।

राज्य ब्यूरो, शिमलाः हिमाचल प्रदेश में भरपुर होता है। यह लुप्त होता जा रहा पहल चिलगोजा और जंगली मशरूम अब है, विलुप्तप्राय वाली श्रेणी में सुचीबद्ध अतिरिक्त मुख्य सचिव तरुण लोगों को आजीविका दिलाएंगे। इसके है। प्रदेश में खाद्य और जंगली मशरूम कपुर ने दी जानकारी लिए वैज्ञानिक आधार पर प्रक्रिया की एक बड़ी विविधता पाई जाती है। अपनाई जाएगी। हिमाचल प्रदेश गुच्छी अपने स्वाद और औषधीय परियोजना को विज्ञान और विज्ञान एवं प्रौद्योगिकी और पर्यावरण गुणों के लिए राष्ट्रीय और अंतरराष्ट्रीय प्रौद्योगिकी विभाग ने दी मंजरी परिषद यानी हिमकोस्ट शिमला और बाजार में बहुत प्रसिद्ध और अत्यधिक हिमालयन वन अनुसंधान संस्थान

हिमकोस्ट के चेयरपर्सन तरुण कपूर ने कार्यशाला का किया शुभारंभ

चिल्गोजा-जंगली मशरूम पर होगा शोध कार्य

शिमला, 23 जून (मनोज) : चिल्गोजा और जंगली मशरूम के संरक्षण को लेकर होटल होली-डे होम में एक दिवसीय कार्याशाला का आयोजन किया। कार्याशाला का श्भारंभ हिमाचल प्रदेश विज्ञान, प्रौद्योगिकी और पर्यावरण परिषद के चेयरपर्सन तरुण कपुर ने दीप प्रज्वलित कर किया। इस दौरान उन्होंने जिल्गोजा और जंगली मशरूम पर आधारित बुक लैट का भी विमोचन किया। कार्याशाला का मुख्य उद्देश्य हिमाचल में पाए जाने वाला चिल्गोजा और जंगली मशरूम की किस्मों में वैज्ञानिक तरीकों से सुधार कर किसानों की आर्थिकी को सुदुढ करना था। हिमाचल प्रदेश विज्ञान, प्रौद्योगिकी और पर्यावरण परिषद से सदस्य सचिव कणाल सत्यार्थी ने बताया कि हिमकोस्ट शिमला और एचएफआरआई हिमाचल में चिल्गोजा और जंगली मशरूम के संरक्षण पर मिलकर काम करेंगे। सुबे में चिलगोजा और महत्वपूर्ण जंगली मशरूम में वैज्ञानिक हस्तक्षेपों के माध्यम

से आजीविका उत्पादन में सुधार पर अध्ययन परियोजना को विज्ञान और प्रौद्योगिकी विभाग डीएसटी सरकार ने मंजुरी दे दी है। इस परियोजना की कुल लागत 1.96 करोड रुपए हैं। दोनों संस्थान इस परियोजना को तीन साल की अवधि में पुरा करेंगे। इस अध्ययन का लक्ष्य स्थानीय किसानों की आजीविका पीढी में वैज्ञानिक हस्तक्षेपों के माध्यम से पाईनस जेरार्डियाना वॉल में सुधार करने के लिए और महत्वपूर्ण जंगली मशरूम में सुधार पर कई अध्ययन करना है। उन्होंने बताया कि चिल्गोजा हिमाचल में जिला किन्नौर के सतलुज वैली, चंबा जिला के भरमौर और पांगी में में समुद्र तल से 1800 से 3350 मीटर के बीच की उंचाई पर पाया जाता है। इसके अलावा यह पाईन पूर्वी अपगानिस्तान, पाकिस्तान और उत्तर-पश्चिम भारत में उत्तर-पश्चिमी हिमालय क्षेत्र का मूल निवासी है। उन्होंने बताया कि कई जैविक और अजैविक कारकों के कारण चिल्गोजा पाइन का प्राकृतिक पुनर्जन्म

बहत कम है। इसके बीज को स्थानीय लोग न्योजा या चिल्गोजा के नाम से विक्रय करते हैं जिसे सूखे फल के रूप में खाया जाता है जो तेल, स्टार्च, प्रोटीन और एल्बिनोइड्स में समृद्ध होते हैं। यह किन्नौर जिले में रहने वाले जनजातीय लोगों की सबसे महत्वपूर्ण नकद फसलों में से एक है। इसके संरक्षण के लिए उपयुक्त रणनीतियों के विकास वर्तमान कटाई प्रथाओं, बीज परिपक्वता सूचकांक, दीर्घायु और पाईनस जेरार्डियाना में बीज स्त्रोतों में भिन्नता के बारे में विस्तृत अध्ययन के लिए किया जाएगा। कार्यशाला में हिमाचल विज्ञान, प्रौद्योगिकी और पर्यावरण परिषद, हिमालयन वन अनुसंधान संस्थान, एचपीयु, नौणी विवि, पंजाबी यूनिवर्सिटी, फॉरेस्ट रिसर्च संस्थान दूराहदून, जम्मू विश्वविद्यालय, आईटीबीपी के अलावा शुलिनी युनिवर्सिटी और जेपी युनिवर्सिटी के वैज्ञानिकों, प्रोफेसरो और असिस्टेंट प्रोफेसरों ने भाग लिया।



कार्यशाला का आयोजन

शिमला, 23 जून (ब्यूरो): हिमाचल में चिलगोजा और जंगली मशरूम के संरक्षण को लेकर शिमला के होलीडे होम में शुक्रवार को बैठक की गई, जिसमें विज्ञान प्रौद्योगिकी, पर्यावरण परिषद और हिमालयन वन अनुसंधान संस्थान (एच.एफ.आर.आई.) के अधिकारी मौजद रहे। बैठक की अध्यक्षता सदस्य सचिव विज्ञान प्रौद्योगिकी, पर्यावरण परिषद कुनाल ने की। बैठक में अधिकारियों के बीच संरक्षण को लेकर चर्चा हुई।अधिकारियों का कहना है कि चिलगोजा और जंगली मशरूम के संरक्षण से लोगों की आजीविका भी बढेगी। चिलगोजा और महत्वपूर्ण जंगली मशरूम में वैज्ञानिक हस्तक्षेप के माध्यम से आजीविका उत्पादन में सधार पर अध्ययन परियोजना को विज्ञान और प्रौद्योगिकी विभाग डी.एस.टी. सरकार द्वारा मंजुरी दे दी गई है।

पंजाब केसरी Sun, 24 June 2018 ई-पेपर epaper.punjabkesari.in