Non-Detriment Findings for *Nardostachys jatamansi* (D.Don) DC. from Nepal

Government of Nepal
Ministry of Forests & Environment
Department of Plant Resources

Issued by:

Department of Plant Resources

(The Scientific Authority of CITES plants in Nepal)
Ministry of Forests and Environment
Government of Nepal
Kathmandu
(2025)

Citation:
DPR, 2025. Non-detriment findings for *Nardostachys jatamansi* (D.Don) DC. from Nepal. Department of Plant Resources (DPR), Ministry of Forests and Environment, Government of Nepal.

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Published by:
Department of Plant Resources
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Abbreviations

AAH	: Annual Allowable Harvest
CITES	: Convention on International Trade in Endangered Species of Wild Fauna and Flora
DDG	: Deputy Director General
DFMP	: District Forest Management Plan
DFO	: Division Forest Office
DoF	: Department of Forests (then)
DoFSC	: Department of Forests and Soil Conservation
DNPWC	: Department of National Parks and Wildlife Conservation
DPR	: Department of Plant Resources
EIA	: Environmental Impact Assessment
IEE	: Initial Environmental Examination
GoN	: Government of Nepal
KATH	: National Herbarium and Plant Laboratories
MAPs	: Medicinal and Aromatic Plants
MFSC	: Ministry of Forests and Soil Conservation (then)
MoFE	: Ministry of Forests and Environment
MT	: Metric Ton
NHPL	: National Herbarium and Plant Laboratories
NWFP	: Non-wood Forest Product
RST	: Review of Significant Trade
RP	: Rotation Period
SDFO	: Sub-division Forest Office

Summary

Date :7/17/2025

Nardostachys jatamansi, commonly known as *Jatamasi* in Nepal, is a valuable medicinal and aromatic plant species native to the High Mountains and Himalaya regions of Nepal. Nepal is one of the primary resource countries for this species, with its distribution spanning more than 28 districts.

The species is listed as "Critically Endangered" on the IUCN Red List and is included in Appendix II of CITES. While global studies report a declining trend in its population, evidence suggests that *N. jatamansi* populations in Nepal are stable. This stability is largely attributed to the Government of Nepal's robust conservation, management, and sustainable utilization policies and programs. In support of this claim, a radar graph developed using the 26 distinct criteria outlined in Appendix 2 of the CITES "Factors for Evaluation of Threats" has been utilized. The analysis shows a favorable status for sustainable harvesting and trade.

This Non-Detriment Finding (NDF) for *N. jatamansi* has been prepared by the Department of Plant Resources, Nepal's CITES Scientific Authority in close coordination with the Department of Forests and Soil Conservation, the designated CITES Management Authority. The preparation follows the *NDF Guidance for CITES Scientific Authorities: A Checklist to Assist in Making NDFs for Appendix II Exports*.

Based on the data, the total growing stock of *N. jatamansi* in Nepal is estimated at 24,188.08 metric tons (MT). The proposed harvest quota is 15% of this stock, totaling 3,628.21 MT over five years an average of 725.6 MT per year. Of this, 25.6 MT will be allocated for domestic use, and 700 MT (700,000 kg) will be designated for international trade annually.

Given an average essential oil yield of 1.4% (v/w), approximately 9,800 liters of essential oil and 690,746 kg of marc are expected to be exported after processing each year.

The CITES Scientific and Management Authorities of Nepal are committed to continuous monitoring, enforcement of national laws, and strict compliance with CITES provisions to ensure the sustainable management and long-term survival of *Nardostachys jatamansi* in its natural habitat.

Summary Table:

Topic	Key Finding	Action
Total growing stocks	24,188.08 MT	Monitoring
Population Trend	Increasing in Nepal	Monitoring
National quota	725.6 MT of dry rhizome per year	Review after 5 years
Quota for Domestic trade	25.6 MT of dry rhizome per year	Monitoring of industrial demand
Quota for international trade	*Jatamasi* oil: 9800 liters Marc: 690746 kg	Monitoring of legal trade and permit.
Main threat	Increasing Trade demand	Encourage cultivation

Keywords: District Forest Management Plan, Environmental Impact Assessment, Harvest, Initial Environmental Examination, *Jatamasi*, Population Management, Sustainability, National Quota, *Jatamasi* marc, *Jatamasi* essential oil.

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1.0 Background Information on the Taxa

Nardostachys jatamansi (D. Don) DC. (Syn. *Nardostachys grandiflora* DC.) is a dicotyledonous flowering plant which belongs to the family Caprifoliaceae. In CITES, the species is still listed as *Nardostachys grandiflora* DC as an accepted name under the family Valerianaceae (https://checklist.cites.org/).

Taxonomic Classification
Plantae
Tracheophytes
Angiosperms
Eudicots
Asterids
Dipsacales
Caprifoliaceae
Nardostachys
N. jatamansi (D. Don) DC.
Synonyms: *N. grandiflora* DC.
N. chinensis Batalin
Patrina jatamansi D. Don

Nepali name: *Jatamasi*, *Bhultye*
Common name:
English – Himalayan spikenard
French – Nard de l' Himalaya
Trade name: *Jatamansi*, *Balchhad*, *Bhultye*

It is a perennial flowering herb growing in rocky slopes, rock outcrops, meadows, shrubland, and forests of Himalayan region. This species is distributed throughout the Himalayan region between the altitude of 3200 m to 5000 m. It is a slow-growing plant species that regenerates from its rhizomes and seeds. It is one of the most valuable commodities that support the livelihoods of rural people in Nepal's mountainous regions and Nepal is a major exporter of *Jatamasi* semi-processed products.

The semi-processed products include spikenard essential oil, which has a distinct musky fragrance, and marc (residue after oil extraction), both obtained from *Jatamasi* rhizomes, and are exported to various countries from Nepal. The marc of *Jatamasi* is used to prepare instant sticks whereas the essential oil is used for various purposes ranging from perfumes to pharmaceuticals. The major chemical constituents in the rhizome essential oil of *Jatamasi* are α-Gurjunene, Calarene, β-Vatirenene, Valerena-4,7(11)-diene, Laurene, Valencene, Nardol A, 1(10)-Aristolen-9β-ol, Jatamansone, Valeranal, and *cis*-Valerinic acid (Satyal, Chhetri, Dosoky, Poudel, & Setzer, 2015). The compounds are responsible for several pharmacological activities such as Antifungal, Hepatoprotective, Central Nervous System, Anticonvulsant, Neuroprotective, Antiparkinson's activity, Antioxidant, Antidiabetic, Tranquilizing, Nematicidal and Antibacterial activities (Pathak & Godela, 2024).

The species was included in CITES Appendix II in 1997, and its export in raw form has been banned since 2000. According to the CITES trade database, Nepal has been exporting derivatives and spikenard oil to different countries since 2008. Initially, the trade volume was relatively small

due to the limited number of processing industries; however, it gradually increased between 2009 and 2016. It resulted in over-harvesting leading to the probability of extinction of this species. As a result, the Government of Nepal adopted the CITES Act in 2017, and the collection, domestic trade, and international export of this species were prohibited in May 2017. To rectify the unintended ban on trade of this species, the GoN followed the recommendations from the Plant Committee and CITES Secretariat and prepared the NDF for this species with a precautionary quota of 382.7 metric tons of dry rhizomes or its equivalent in essential oil and derivatives. The NDF was submitted to the CITES Secretariat in September 2019 and the Secretariat published this quota on its website on February 19, 2020 as the 2019 additional quota. Since then, the Secretariat has published quota of the same quantity each year, and an equivalent amount of essential oil and marc of *Jatamasi* has been exported from Nepal.

The status of the *Jatamasi* population and its growing stocks have been studied in all major *Jatamasi* resource districts of Nepal. The study suggests that the growing stock of this species has been increasing in Nepal because of the various strict conservation and management plans, programs, and activities implemented by the Government of Nepal.

2.0 Materials and Methods

This report provides the updated non-detriment findings for *Nardostachys jatamansi*, 2019. It is prepared using the most current information available about this species. The distribution of *Jatamasi* is based on herbarium records from the National Herbarium and Plant Laboratories (KATH) and the Tribhuvan University Central Herbarium (TUCH) in Nepal, along with various published literature. Detailed data on its availability and growing stocks was obtained from the approved "Division Forest Management Plan."

Population status was derived from published literature, field visit reports from the DPR, and the five-year Division Forest Management Plans (DFMP) of the respective Division Forest Offices, which also reported the Annual Allowable Harvesting (AAH) quantity.

The inventory of *Jatamasi* was carried out during the preparation of the district forest management plan, in accordance with the 'Non-Timber Forest Products Inventory Guideline 2012' (DoF, 2012). The trade status of the species from 2020 to 2024 was determined from CITES permits issued by the Department of Forests and Soil Conservation. Finally, this report was prepared following the resolution (Conf. 16.7 (Rev. Cop 17)) on non-detrimental findings.

3.0 Findings

3.1 Synonyms and Trade restrictions

Nardostachys grandiflora DC., listed under the family Valerianaceae, is considered a synonym of *Nardostachys jatamansi* (D. Don) DC, which belongs to the family Caprifoliaceae (POWO, 2025). In CITES, the species is still listed as *Nardostachys grandiflora* DC (https://checklist.cites.org/). Other synonyms for this species include *Nardostachys chinensis* Batalin and *Valeriana jatamansi* D. Don.

Nardostachys jatamansi is included in Appendix II of CITES and Annex B of the EU Regulation for all origin countries. During the seventy-fifth Standing Committee meeting in Panama City on November 13, 2022, it was decided to remove *Nardostachys jatamansi* from the RST process.

3.2 National Distribution and Abundance

Nardostachys jatamansi is native to high mountainous regions. Various reports, publications, and herbarium records specify that the species has been widely distributed across 28 mountainous districts of Nepal, spanning from east to west within an altitudinal range of 3200 to 5000 meters (Press, Shrestha, & Sutton, 2000).

Figure 1: A flowering Jatamasi Plant © Dipesh Pyakurel

a. Province-wise distribution of *Jatamasi*

Based on the record of *Jatamasi* herbarium specimens deposited at National Herbarium and Plant Laboratories (KATH), Tribhuvan University Central Herbarium (TUCH), and various other international herbaria such as Royal Botanic Garden, Edinburgh and the University of Tokyo, Japan, *N. jatamansi* is found in 22 districts of Nepal. These specimens were collected from different localities within the following districts of Nepal: Bajhang, Darchula, Dailekh, Dolakha, Dolpa, Gorkha, Humla, Jumla, Kaski, Lamjung, Manang, Mugu, Mustang, Myagdi, Panchthar, Ramechhap, Rasuwa, Rukum, Sankhuwasabha, Sindhupalchok, Solukhumbu, and Taplejung. Details are shown in Figure 2 and Table 1 below.

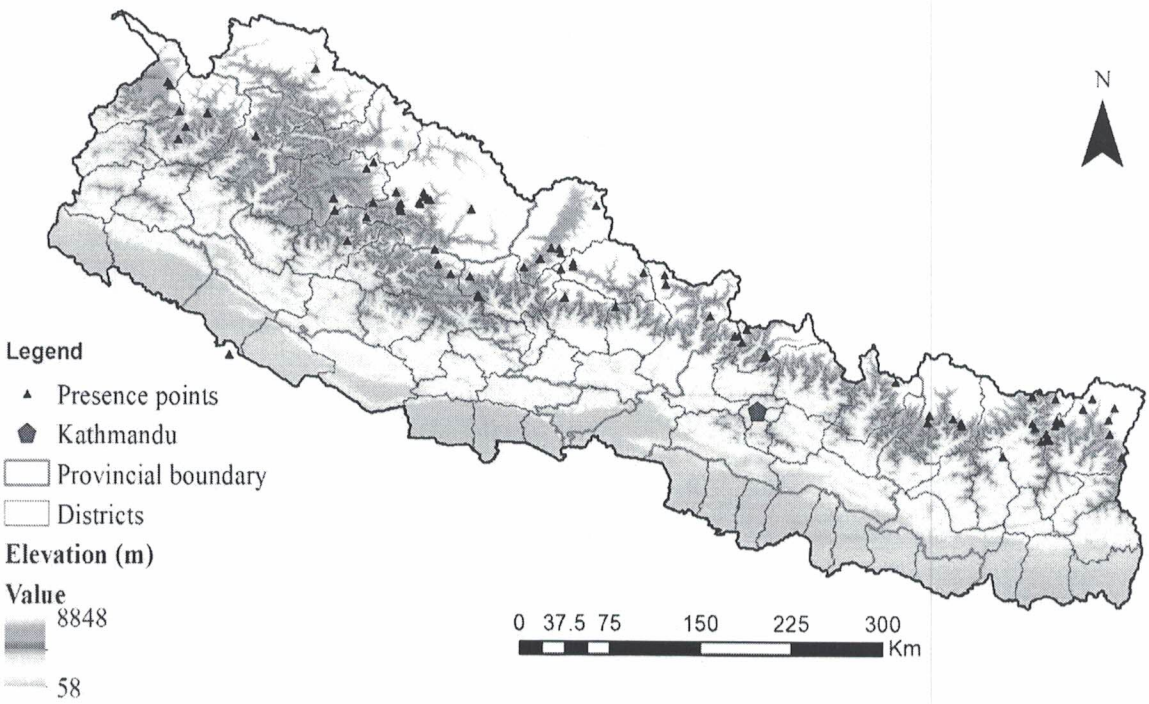


Figure 2: Province-wise distribution of Jatamasi

Table 1: Distribution of N. jatamansi

Province	District	Locality	Altitude	Remarks
Koshi	Taplejung	Topkegola, Tin Pokhari - Banduke.. Lelep Olangchung Gola	4000 m 4150 m 3500 m 4000 m	
	Sankhuwasabha	Jaljale Cha Ding Kharka Banduke	3800 m 3980 m 4170 m	
	Pachthar	Pahademegu	3800 m – 4100 m	
	Solukhumbu	Rangdu Kharka, Beni Kharka Khola Kharka Jar Kharka Thasing Dingma	4100 m 4000 m 4100 m 4000 m 3500 m	
Bagmati	Ramechhap	Neju-Pasinge Kharka, Jata Pokhari-Panch Pokhari, Botase Kharka, Koshing Kharka,	33850 – 4500 m	
	Rasuwa	Yure Kharka-Timbe Kharka, Jaisuli kund, Seto kund Laurivinayak – Sing Gomba Ghopte Gosaithan	3700 – 4295 m	
	Sindhupalchok	Helambu, Dayangdunge pahad	4000 m 3237 m	
	Dolakha	Beding	3650 m	
Gandaki	Gorkha	Uhiya vdc Paple lekh Near Sama gaon	3350 – 3940 m 3769 m 3710 m	
	Lamjung	Rambrong Pass		
	Mustang	Kaisang, Omang Kharka Above Sangda Pass Thorong phedi Muktinath – Thorungse Pakkharka Yak Kharka, above Marpha Kyungchhama khola Zhaite	4200 m 4600 m 4000 m 4200 m 4030 m 3880 – 4000 m 4250 – 4430 m 4300 m	
	Myagdi	Jalja La Chhau Kharka	3480 m 3560 m	
	Manang	Khangsar Phedi Ledar, Thorung Manang valley Buki Danda, Nachai	4100 m 4400 m 4200 – 5300 m 4100 m 3776 m	

		Upper Manang	5000 m	
	Kaski	Dhumpush	4100 m	
Lumbini	Rukum east	Chalikhe Pahar		
Karnali	Jumla	Chakhure lekh Dhauli Daha Patarasi	3800 m 4300 m 4075 m	
	Humla	Changla khola, Dozam valley		
	Dolpa	Near Phoksundo lake	3660 m	
	Dailekh	Danda goth, Naumule	3120 m	
Sudurpaschim	Darchula	Mechchra Chheti	3640 m 3700 m	
	Bajura	Chauki lekh		
	Bajhang	Manane lekh Surma sarovar Gorkhali Lekh	3777 m 4150 m 3570 m	

b. Abundance

Approximately 3.1% of Nepal's total area is suitable habitat for *N. jatamansi*, which is about 4609 Km² or 460900 hectares. Using a conservative estimate of 141 kg of air-dried rhizome per hectare, the total rhizome mass amounts to 64986900 kg or 64986.9 metric tons (Smith-Hall C., et al., 2023).

Table 2: Province-wise Stock of N. jatamansi (Smith-Hall, et al., 2023)

Provinces	**Suitable area (ha)**	**Growing stock (MT)**
Koshi	92434	13,033
Bagmati	62977	8,879
Gandaki	127069	17,916
Lumbini	12338	1,739
Karnali	135441	19,097
Sudurpaschim	30666	4,323
Total	**460925**	**64,987**

3.3 Habitat

N. jatamansi is mostly found in rocky slopes, rock outcrops, meadows, shrubland, and inside forests (Ghimire, Gimenez, Pradel, McKey, & Aumeeruddy-Thomas, 2008).

3.4 Biological characteristics

3.4.1 Morphology

Jatamasi is a perennial, aromatic, herbaceous plant of 10-60 cm height.

Rhizome: size is 4 to 20 cm long and 3 cm wide, dark grey, woody, thickened, and is covered with reddish brown, tufted, fibrous remains of the petioles of dead leaves (Figure 3).

Leaves: simple, rosette at base or opposite on stems, lanceolate, entire. Basal leaves linear to narrowly spathulate, (2.5-) 4-15 (-26) x 0.4-1.7 (-2.4) cm, glabrous or pilose on main veins and margin, cauline leaves narrowly ovate to ovate or oblong, 2-5.4 x 0.4-1.4 cm, margin entire, cuneate or serrulate.

Inflorescences: terminal capitulum.

Flowers: flowering stems erect, 9-30 cm. Flower heads nearly 2 cm in diameter. Calyx 5-lobed, 2-2.8 mm, entire or toothed. Corolla 5-lobed, unequal at base, tubular-campanulate, (4.5-) 5.5 x 13 mm, white, pinkish to purplish white, pink to purple, hairy. Stamens 4.

Fruits: obovate, flattened, ca. 5 x 2.5 mm, 1-seeded.

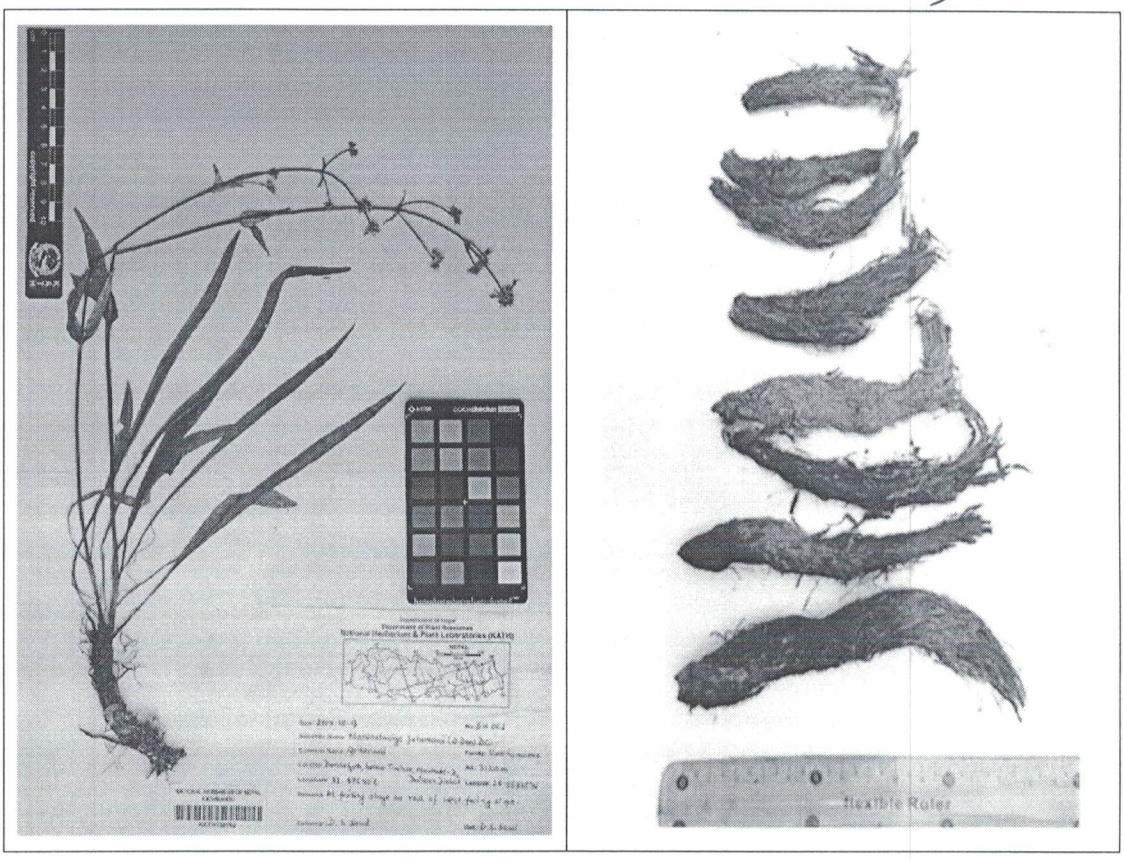


Figure 3: Herbarium specimen of N. jatamansi and different sizes rhizomes of Jatamasi.

Used/Traded part: Dry rhizome

Weight of rhizome: Average dry biomass of rhizome per plant is 3 g ***(DoF, 2017)***.

Oil Percentage: 0.8% - 2 % (average = 1.4%) ***(DPR, 2024)***.

3.4.2 Reproduction and Life Cycle

It is a slow-growing perennial species. Its growing season is short and extends from May to early October. A single plant can have up to 21 ramets in a dense cluster. Each ramet generally produces one or, in rare cases, two to three inflorescences in June–July. A single inflorescence can produce up to 25 seeds, which mature in August-September. Seeds are passively dispersed in late September by wind, water, or gravity, and germinate by May-June of the following year.

The germination rate of seeds ranges from 10% to 80%. ((Nautiyal, Chauhan, Prakash, & Purohit, 2003); (Regmi, Bista, & Casey, 2000); Nautiyal and Nautiyal, 2004 cited in (Mulliken & Crofton, 2008)). Seedlings grow into small rosettes during their first year.

The growth of seedlings to reproductive adults may take 3-4 years (Nautiyal, Chauhan, Prakash, & Purohit, 2003). A study from Dolpa, Nepal, found the survival rates of adults, juveniles, and seedlings to be 88-100%, 68-90% and 46-78%, respectively (Ghimire, Gimenez, Pradel, McKey, & Aumeeruddy-Thomas, 2008). Population growth rates are reported significantly higher in meadows compared to rocky outcrops due to differences in flowering frequency, seed mass, and seedling recruitment (Ghimire, Gimenez, Pradel, McKey, & Aumeeruddy-Thomas, 2008). Reproduction also takes place through rhizomes (Clonal growth).

3.5 Population Status

The population status of this species has been estimated by studying various published literatures and reviewing the approved District Forest Management Plans (DFMP) of resource rich districts. These approved DFMPs have done inventory of major NTFPs covering *N. jatamansi* of respective district by following 'Non-Timber Forest Products Inventory Guideline 2012' (DoF, 2012).

The population status as well as frequency, average density, productivity potential and distribution areas of the *N. jatamansi*, which have been studied by various authors and organizations before 2019 were taken in NDF, 2019. The literature review shows that very few studies were done on the population status of this species after 2019 (Dhakal, Maharjan, Rijal, & Pathak, 2021; ANSAB, 2023). The field survey done in 2021 by DPR in Manedada, Gaurisankar Conservation Area (GCA) taking the sampling plots of 5m x 5m sizes in different altitude from 3800 to 3900 m showed much higher frequency, that ranged from 88.9 % to 100 % and density from 64 to 84 individual/m^2 in Nepal (Dhakal, Maharjan, Rijal, & Pathak, 2021). Similarly, the study done by ANSAB in 29 community forests (CF) of five districts showed that the average frequency of the mature plants of *N. jatamansi* in dense areas is 18.31%, varying from 10% (in Thala CF and Thali CF, Humla) to 72 % (Mauri CF, Humla). Likewise, the average frequency of the mature plants of *N. jatamansi* in sparse areas is 12.34% varying from 5% (in Thala CF, Humla) to 66 % (Mauri CF, Humla). Similarly, the average density of the mature plants of *N. jatamansi* in dense areas was reported to be 697.34 individuals per hectare varying from 111 ind./ha to 1606 ind./ha. Likewise, the average density of the mature plants of *N. jatamansi* in sparse areas was reported to be 300.21 individual per hectare, varying from 62 ind./ha to 910 ind./ha (Table 3).

Table 3: The site-specific population status of N. jatamansi (ANSAB, 2023)

S. N.	Study sites	Districts	Effective area (ha)		Density of mature plants (ind./ ha)		Frequency of mature plants (%)		Total GS (Tons)
			Dense	sparse	Dense	sparse	Dense	sparse	
1.	Chuwathopka CF	Mugu	40.1	6.0	781.00	419	16	9	5.40
2.	Sherok CF	Mugu	24.5	5.3	1505.00	484	17	12	2.80
3.	Ladegadh CF	Mugu	12.2	1.4	1341.00	612	17	9	1.48
4.	Chulya CF	Mugu	22.8	3.9	1049.00	80	13	8	2.84
5.	Pangsarin CF	Mugu	18.0	4.9	2814.00	910	17	12	1.38
6.	Mauri CF	Humla	51.4	20.2	758.00	327	72	66	21.06
7.	Goraktu CF	Humla	40.7	6.9	376.00	149	15	7	8.75
8.	Hilsa CF	Humla	40.2	9.7	707.00	112	15	10	8.72
9.	Thala CF	Humla	39.5	9.9	1278.00	447	10	5	9.43
10.	Thali CF	Humla	44.7	7.0	470.00	650	10	7	10.78
11.	Takpafuk CF	Humla	28.3	6.5	1188.00	123	11	7	4.63
12.	Torpahutik CF	Humla	9.9	1.0	562.00	443	16	9	1.44
13.	Sallikhola CF	Humla	21.9	9.7	1606.00	673	14	17	3.55
14.	Gurgure CF	Humla	32.2	9.8	707.00	559	12	10	4.37
15.	Maharudra CF	Jumla	42.1	9.9	320.00	104	17	11	9.56
16.	Deuramai CF	Jumla	43.6	8.9	463.00	221	16	9	7.60
17.	Churkoti CF	Jumla	33.1	9.8	750.00	275	15	10	5.34
18.	Nadai CF	Jumla	21.8	5.5	1541.00	429	16	8	2.04
19.	Khatkate CF	Bajhang	41.2	8.8	347.00	310	12	9	9.55
20.	Juttebhadmaya CF	Bajhang	15.0	3.9	172.00	172	14	10	3.08
21.	Yekchale CF	Bajhang	3.0	1.0	118.00	235	17	16	0.51
22.	Liche CF	Bajhang	11.1	1.8	222.00	232	15	7	1.55
23.	Panbhelbira CF	Bajhang	33.2	3.7	111.00	156	30	12	4.88
24.	Chiurigaad CF	Bajhang	16.3	3.5	156.00	117	22	13	0.79
25.	Bhawanidhaula CF	Darchula	20.9	2.4	290.00	97	24	10	1.68
26.	Siyaladigarful CF	Darchula	26.7	4.1	173.00	65	33	14	2.44
27.	Surmabhawani CF	Darchula	15.5	2.9	141.00	97	25	13	2.53
28.	Deulighat CF	Darchula	25.4	4.8	68.00	146	25	13	4.04
29.	Kalimati CF	Darchula	22.3	4.9	320.00	62	25	15	3.99
Total			**3,895.2**	**875.6**	**697.34 (avg)**	**300.21(avg)**	**18.31 (avg)**	**12.34 (avg)**	**146.21**

The Division Forest Office (the then District Forest Office) is the district-level institution that regulates the local trade of non-timber forest products in Nepal. There are 84 DFOs in 77 districts of Nepal. The DFOs are mandated for the administration of forest resources in their respective jurisdiction. Preparation of the District Forest Management Plan (DFMP) is mandatory for each district, for sustainable harvesting of any forest products, including both timber and non-timber products, which should be approved by the provincial level Ministry of Forests and Environment. Out of 77 districts, DFMPs of 37 districts, which are potentially for

the availability of *Jatamasi*, were studied, and the data from these 37 DFMPs were extracted to review the status of *Jatamasi* (Table 4). This table compares the stock mentioned in recent and previous DFMPs as well as herbarium records. Out of 37 DFMPs, only 26 DFMPs have mentioned the stock of *Jatamasi*. The two districts of Lumbini province, Pyuthan and Rolpa, have not mentioned any quota to harvest *Jatamasi* in their recently available DFMPs, though it was mentioned in previous DFMPs. Likewise, there is herbarium record from two districts of Koshi Province, Pachthar and Sankhuwasabha. It means *Jatamasi* is found in these districts, but there is no information on growing stock and harvest quota from these districts. This shows that for the conservation of the species in these districts, the harvest quota is not mentioned in the DFMPs.

Table 4: Total growing stocks of N. jatamansi in various districts according to DFMP and EIA report

S. N.	Districts	In previous DFMP mentioned in NDF 2019 (MT)	In recent available DFMP (MT)	Herbarium record
Koshi Provice				
1.	Bhojpur	NA	NA	No
2.	Khotang	NA	NA	No
3.	Okhaldhunga	NA	NA	No
4	Pachthar	NA	-	Yes
5.	Sankhuwasabha	NA	NA	Yes
6.	Solukhumbu	1.2	202.7	Yes
7.	Taplejung	25.0	14.2	Yes
8.	Illam	NA	NA	No
Gandaki Province				
1.	Gorkha (Dharche, Barbak, Sulikot, Ajirkot)	4.9	54	Yes
2.	Kaski	NA	NA	Yes
3.	Lamjung	27.8	27.8	Yes
4.	Manang	36.5	36.466	Yes
5.	Mustang	NA	NA	Yes
6.	Baglung (Harichaur, Taman, Radshinghkitani, Bobang)	5.625	5.625	No
7.	Parvat	NA	NA	No
8.	Myagdi	5.7	10	Yes
Bagmati province				
1.	Ramechap	1.5	1.5	Yes
2.	Dolakha	NA	0.126	Yes
3.	Sindhupalchok	2.25	2.25	Yes
4.	Nuwakot	1.0	1.0	No

5.	Rasuwa	9.62	88	Yes
6.	Dhading	2.0	2.0	No
Lumbini province				
1.	Pyuthan	3.0	3.0	No
2.	Rolpa	20.5	20.5	No
3.	Purbi Rukum	22.0	22	Yes
Karnali Province				
1.	Rukum Paschim	8.0	12	No
2.	Dolpa	440.0	2126.4	Yes
	Shey Phoksundo NP, Dolpa (Buffer Zone)	50.0	-	
3.	Jumla	150	3186.375	Yes
4.	Jajarkot (Barokote, Junichade, Kushe, Nalgad)	306.7	306.7	Yes
5.	Dailekh	49.736	49.736	Yes
6.	Kalikot	594.2	82.2	No
7.	Mugu	223.2	831.100	No
8.	Humla (Raya, Sarkideu, Thehe, Kharpunath, Rodikot, Srimantha, Melcham, Darma, Mimi, Kalika, Khagalgau, Hepka)	17000	17000	Yes
Sudurpaschim Province				
1.	Doti	5.0	5.0	No
2.	Bajhang	47.8	47.8	Yes
3.	Darchula (Api Nampa Conservation Area)	1.7	-	Yes
4.	Bajura	158.1	49.6	Yes
Total		**19,203.03**	**24,188.08**	

Table 4 shows that the total growing stock TGS is 24,188.08 metric tons which has been increased from 19,203 metric tons as prescribed in NDF 2019. This increment in TGS is because of the strong restriction for collection of species from 2017 to 2019 and implementation of quota system for trade since 2020.

3.6 Conservation Status and Threats

A. Conservation Status

The conservation status of *N. jatamansi* has been assessed by various organizations and scientific studies, using different criteria and indicators. Based on the assessment, this species has been ranked from vulnerable to critically endangered, as shown in Table 5:

Table 5: Conservation status of N. jatamansi

(Chauhan, 2021)	(CAMP, 2001)	(Shrestha & Joshi, 1996)	(Shrestha & Shrestha, 2012) **(LNP)**	(Lama, Ghimire, & Aumeeruddy-Thomas, 2001) **(Dolpa)**
Critically Endangered	Vulnerable	Vulnerable	Most Vulnerable	Highly Vulnerable

3.6.1 Global Status

According to the IUCN assessment globally in 2021, *N. jatamansi* was classified as Critically Endangered (Chauhan, 2021).

3.6.2 National Status

Nationally, *N. jatamansi* was assessed as vulnerable (CAMP, 2001) (Shrestha & Joshi, 1996), and also as the most vulnerable (Pyakurel, Smith-Hall, Bhattarai-Sharma, & Ghimire, 2019).

3.6.3 Local Status

N. jatamansi is considered vulnerable in Dolpa (Lama, Ghimire, & Aumeeruddy-Thomas, 2001), and it is the most vulnerable in Langtang National Park (LNP) (Shrestha & Shrestha, 2012).

B. Threats

The major threats to *Nardostachys jatamansi* in Nepal are predominantly anthropogenic, with ignorance being a key underlying factor. Local communities, who are the primary collectors and traders of the species, often lack awareness of its ecological importance and natural regeneration processes, contributing to unsustainable harvesting practices and increasing the risk of extinction.

A study using the Rapid Vulnerability Assessment (RVA) method in the Annapurna Conservation Area identified several specific threats (Khakurel et al., 2024). These include:

- Overexploitation driven by high trade demand,
- Naturally low population density,
- Vulnerable life history traits,
- Premature harvesting motivated by the need for quick income (Pyakurel et al., 2019).

In addition to direct harvesting pressures, habitat loss caused by infrastructure development, agricultural expansion, and the growth of human settlements represents an emerging and significant threat to the survival of this species.

To evaluate the overall threat level, the standardized checklist from *"Guidance for CITES Scientific Authorities: Checklist to Assist in Making Non-Detriment Findings for Appendix II Exports"* (Rosser & Haywood, 2002) was employed. Each question in the checklist was scored, and the resulting data was used to construct a radar graph to visually summarize the threat assessment. The detailed score sheet is provided in **Appendix 2**.

In the radar graph (Figure 4), lower scores correspond to lower threat levels, while higher scores indicate greater risk. For *N. jatamansi*, most scores fall within the range of 1 to 3, signifying a **low to medium level of threat**. The shaded area in the radar graph remains relatively close to the center, further confirming this overall assessment of limited risk.

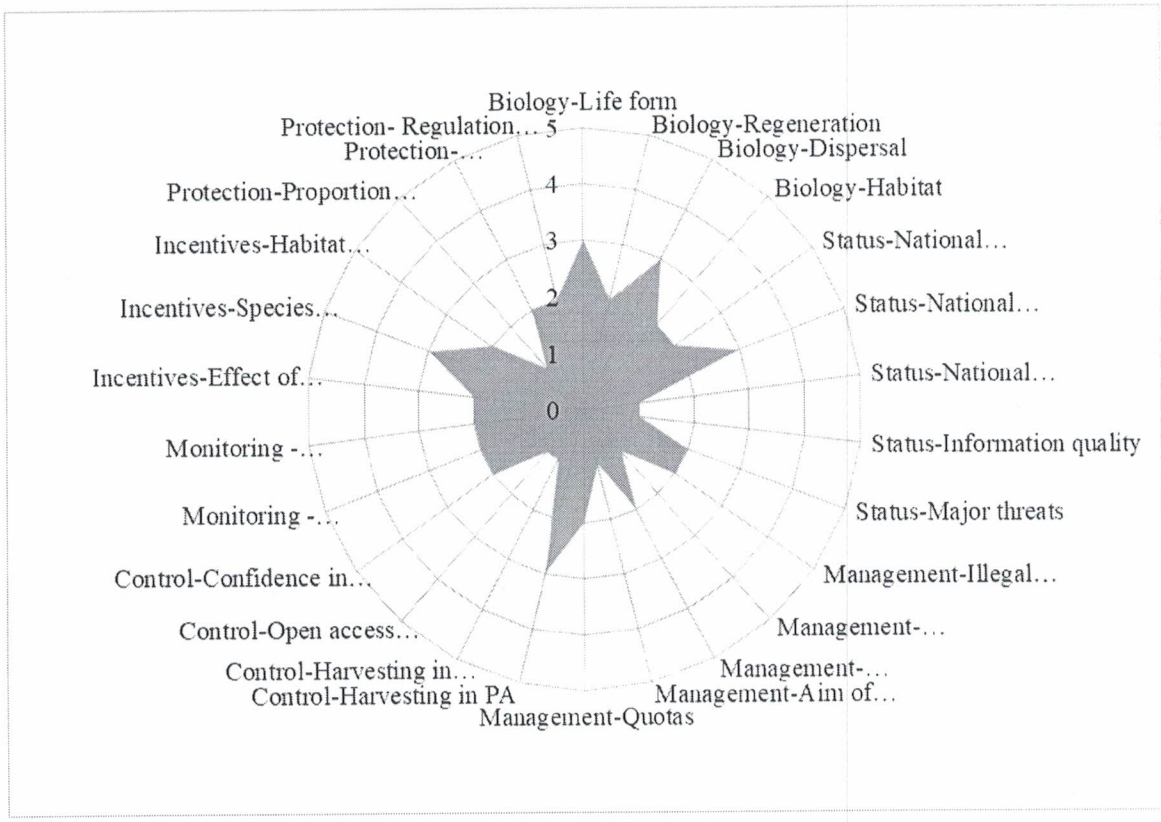


Figure 4: Radar graph of the non-detriment findings for N. jatamansi in Nepal

4.0 Management of the species

There are different management practices in Nepal for the overall management of the forestry resource. The Forest Act, 2019 and its Regulations, 2022 have mandated the Divisional Forest Officers to hand over the National forests to adjoining people for its conservation, management and utilization. Altogether, 23,601 Community Forest User Groups are managing 2.5 million hectares of forest area (MoF, 2025). Most of the habitats of *N. jatamansi* in high mountainous regions have been handed over to the local community for the conservation, utilization and management. The local community has taken stewardship and been effective in restoring the degraded lands and reducing deforestation.

4.1 Harvest management

The government of Nepal has enacted comprehensive laws for conserving, managing, and utilizing timber and non-timber forest products, including Jatamasi. The main laws are as follows:

Jatamasi Conservation Action Plan (2024-2033):

The Department of Plant Resources prepared a 10-year Conservation Action Plan for Jatamasi (*N. jatamansi*) in February 2024. The plan includes specific provisions for the conservation and sustainable use of *N. jatamansi* resources. It also outlines various guidelines for the sustainable utilization and conservation of Jatamasi, along with assurances of budget allocation for the plan's implementation.

Forest Act, 2019 and the Forest Regulations, 2022:

Regulate the trade and harvesting of medicinal plants from forests in Nepal. It has made it mandatory to prepare the District Forest Management Plan and estimate species wise Annual Allowable Harvest (AAH), providing due conservation priorities to harvest any forest products. None of the forest products can be harvested more than the approved AAH.

Exports of *N. jatamansi* was banned in 1995, as specified in the Forest Regulation. Its amendment in 2001 allowed the export of only the processed plant material with the scientific recommendation of the Department of Plant Resources and permission of Department of Forests and Soil Conservation.

Environment Protection Acts, 2019 and Environment Protection Regulations, 2020 (amendment):

Annual extraction of up to 50 metric tons of roots/rhizomes from each district requires IEE, and over 50 tons requires an EIA study.

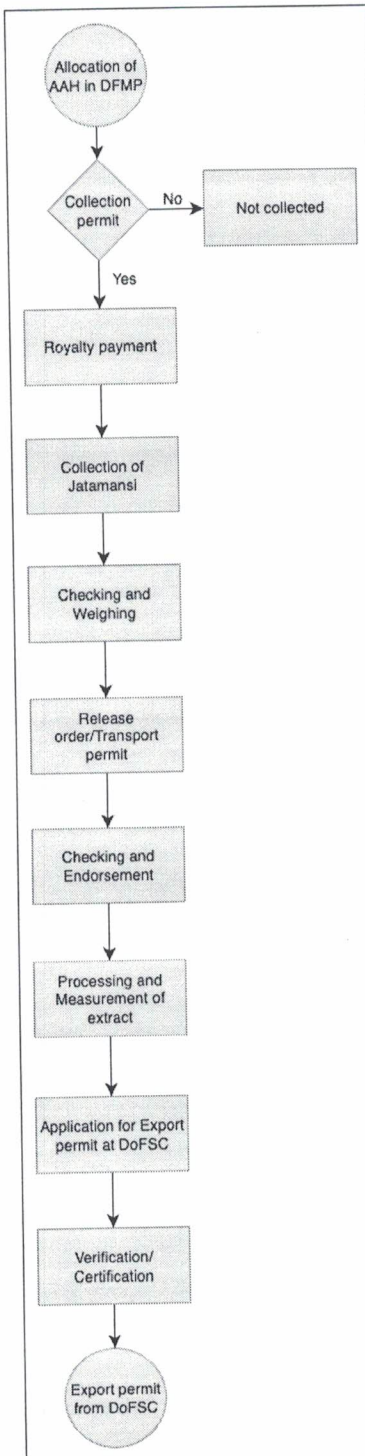
National Parks and Wildlife Conservation Act, 1973:

The major goals of this act are to protect and manage wildlife and habitats throughout Nepal. This act prohibits entry inside national parks and wildlife reserves without permission from an authorized officer. Permission is required to collect any NTFPs' specimen from protected areas and their buffer zones. This act is more conservation focused than such other acts in Nepal.

Control of International Trade of Endangered Wild Fauna and Flora Act (CITES), 2017:

For the effective implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora, 1973, an act is enacted which is cited as 'Control of International Trade of Endangered Wild Fauna and Flora Act, 2017'. The act has been the major instrument for regulating trade of species listed in CITES Appendices, including *Jatamasi* which is in its Appendix II. All activities from collection to export permit of the CITES listed species need to get permission from its Management Authority (DoFSC) at the recommendation of Scientific Authority (DPR) in Nepal. This provision further makes the conservation of *Jatamasi* more effective.

CITES Export permit process



Step-1 (AAH in DFMP): Every DFO prepare a five-year District Level Forest Management Plant including Annual Harvestable Amount of *N. jatamansi.*

Step-2 (Collection Permit): Collectors apply for collection permit with a clear indication of the type of NTFPs being collected, the area, the quantity and the purpose for collection. Collection permits are granted by the DFO in Government managed Forests and Community Forests User Group (CFUG) in Community Forests.

Step-3 (Royalty Payment): Appropriate royalty is paid by the collector as mentioned in article 29 (6) of Forest Regulation 2023 before receiving the collection permit.

Step-4 (Harvesting of *Jatamasi*): *Jatamasi* is harvested by the collector after collecting permit has been granted.

Step-5 (Checking and Weighing): The harvested *Jatamasi* is checked and weighed by the respective Forest offices (DFO/SDFO) or CFUG to tally the amount of *Jatamasi* harvested against the licensed amount.

Step-6 (Release order or transport permit): After checking a release order is issued from DFO for the sale, transport and distribution of harvested *Jatamasi*. The Release order is initially valid for 21 days but can be extended for another 7 days at a time.

Step-7 (Checking and endorsement): The forest officials check the amount and material as per the release order and endorse it with district sealing stamp in sack or Vehicle.

Step-8 (Storing): Raw materials of the *Jatamasi* are stored safely near the processing plant by the traders.

Step-9 (Processing and Measurement of extracts): The raw *Jatamasi*, mostly the rhizome is processed to extract *Jatamasi* essential oil and the residual rhizomes as marc.

Step-10 (Application for CITES Export Permit to DoFSC): A formal application is submitted to DoFSC with necessary documents such as release order, quantity of extracted oil, marc description, and purchase order from importer company/country by the trader.

Step-11 (Verification/ Certification): The sample of *Jatamasi* oil and marc submitted at DoFSC is sent to DPR for verification and certification. DPR provides product testing and certification services for processed extracts and sends them to DoFSC.

Step-12 (Export permit): Finally, DoFSC issues the export permits (stamps) to the applicant (trader) through the concerned DFO for export of *Jatamasi* oil and marc.

4.2 Control of Illegal Harvest:

The CITES Act of 2017 includes provisions for controlling the illegal harvest of *Jatamasi*. According to the act, obtaining a collection permit is required before harvesting, and any

harvesting without such a permit is considered illegal. Such illegal harvesting is punishable under laws like the Forest Act and CITES Act. The Division Forest Office in Jajarkot reported that 1692.04 Kg of illegally harvested *N. jatamansi* was confiscated in 2022.

4.3 Promotion for Cultivation

A total of 33 medicinal and aromatic plants including *N. jatamansi* have been prioritized by the Government of Nepal, for research and economic development (DPR, 2017). *N. jatamansi* is also one of the major species designated among 13 prioritized Non Wood Forests Product species by the Government of Nepal for agro-technology development in the country. DPR promotes the cultivation of medicinal plants, including *Jatamasi*, by providing financial subsidies and technical support (DPR, Grant procedure for herbal development, 2019).

4.4 Monitoring

All tiers of GoN are involved in monitoring the sustainable harvesting and trade of *N. jatamansi*. At the central level, the Ministry of Forests and Environment conducts several monitoring missions regularly to assess the overall performance of resource harvesting and its trade. Similarly, the Department of Forests and Soil Conservation and the Department of Plant Resources monitor the harvesting and trade of the species by issuing export permits and identification certificates, respectively. In addition, DPR collects information about the trade of CITES species from customs offices and compares it with the data provided by the DoFSC as part of monitoring. At the provincial level, monitoring is performed by Divisional Forest Offices. They regularly oversee collection, local processing, and trade-related activities to ensure that collection stays within the allocated quota and that initial processing is completed before trade. At the local level, monitoring is carried out by rural municipalities within their jurisdiction, in accordance with the Constitution of Nepal.

Third-party monitoring is also conducted in Nepal to prevent the illegal harvesting and trade of *N. jatamansi*. During transportation within the country and when exporting to other nations, security personnel, customs officials, and local government representatives inspect the collection permit, the collected amount, and the processed *Jatamasi* marc to ensure compliance with both national and international export laws. The Commission for the Investigation of Abuse of Authority (CIAA; www.ciaa.gov.np), a constitutional body, and the National Vigilance Center (NVC; www.nvc.gov.np), directly under the control of the Prime Minister of Nepal, also conduct regular monitoring and take action against any misappropriation.

Additionally, DPR has published books and posters related to traded CITES plants, including photographs, in Nepali language. These materials have been distributed to raise awareness and assist in monitoring efforts indirectly.

5.0 Trade Status

5.1 Domestic Use and Trade

The *N. jatamansi* is a highly valuable NWFP resource in the mountainous regions of Nepal. Local communities harvest this species for both household (medicinal, religious) and commercial uses. The CITES and Livelihoods case study, 2022, indicates that approximately 15,000 people are involved in harvesting *Jatamasi* for trade in Nepal. Additionally, around 30 distillation companies have been established to extract oil and marc from *Jatamasi* rhizomes. Annually, 300 kg of rhizome and 1000 kg of *Jatamasi* oil are consumed in the Kathmandu Valley (Tiwari, Poudel, & Uprety, 2004). To assess domestic consumption, the DPR visited some companies using *Jatamasi* in their products. A few of these domestic companies and their *Jatamasi*-based products are listed in table 6.

Table 6: Domestic demand of Jatamasi and companies that use it to make products

S. N.	Manufacturer Name	Average consumption of *Jatamasi* rhizome(kg)/year	*Jatamasi* Products	Demand
1.	Herbs production & Processing Co. Ltd., Kathmandu	12000	1. Sancho Jata Kesh oil 2. Tension relief oil	100L oil/year
2.	Singha Durbar Vaidhyakhana Bikash Samiti, Kathmandu	50	1. Tapaswini bati 2. Chandanadi Churna 3. Jesthalbangadi 4. Sarpagandhandhan bati 5. Dasmularist 6. Asogandha tel 7. Mahamarichyadi tel 8. Sringabharak ras	500kg rhizome/year
3.	Gorkha Ayurved Company Pvt. Ltd., Gorkha	286	Tensarin tab	400kg rhizome/year
4.	Saptarishi Oil and Cosmetic Industry, Kathmandu	27	Shreekesh Jadibuti Hair Oil	

5.2 International Trade and Quota

International Trade

Nepal has prioritized MAPs as one of the key commodities among 19 major products that contribute to our competitive advantage for the potential export sector (GoN/MoC, 2016).

Nepal has been exporting various MAPs, including *Jatamasi*, for a long time. The Government of Nepal has implemented several specific laws and policies to facilitate the international trade of *Jatamasi* and to prevent overexploitation.

The export of *Jatamasi* in raw form has been banned since 2001 by the Forest Regulations, 1995. Any unprocessed rhizomes of *N. jatamansi* are strictly prohibited from export. Therefore, only the essential oil and marc obtained after processing are exported from Nepal. This is further supported by the increased quantity of essential oil and marc exported during the later period (2013-2017) compared to the earlier period (2008-2012) (DPR, 2019).

Quota

In 2020, Nepal was allocated an annual quota of 382.7 metric tons of dry weight of *Jatamasi* rhizome or root, or its equivalent derivatives, as an additional quota for 2019. Starting in 2021, the secretariat announced an export quota of 5782 L of *Jatamasi* oil and 376800 kg of derivatives (root pith). Since then, Nepal has been exporting *Jatamasi* oil and marc to various countries, though these shipments are below the annual quota. The main markets for *Jatamasi* oil are India and the USA, while India, UAE, Pakistan, and Bangladesh are the primary markets for marc. The total export quantities of marc and oil, along with their destinations, are listed in Table 7.

Table 7: Export quantity of Oil and Marc of N. jatamansi in different countries and annual quota

***Jatamasi* oil**								
S. N.	**Country**	**Weight (kg)/ Year**						**Total (kg)**
		2020	**2021**	**2022**	**2023**	**2024**	***2025 (Till June 15)**	
1	India	2895.4	2991.5	2575	2813	2325.07	2829.195	16429.165
2	USA	245	601	310	361	256.5	6.075	1779.575
3	Switzerland	0	50	5	7.5	0	0	62.5
4	Belgium	1	0	10	0	0	0	11
5	Canada	20	10	0	0	0.5	0.5	31
6	Japan	2	1	2	0	0	0	5
7	France	6	1	10	0	0	0	17
8	China	30	0	0	4	4	2	40
9	Taiwan	11	5	0	2	1.013	0	19.013
10	Bangladesh	0	0	0	0	0	0	0
11	UAE	0	67	100	100	0	25	292
12	Pakistan	0	0	0	0	0	0	0
13	Germany	0	11	0	0	46.329	0	57.329
14	UK	0	5	0	5	0	0	10
15	Italy	0	0	5	0	0	0	5

19	Austria	0	0	0	5	0	0	5
20	Bulgaria	0	0	0	0	3	0	3
21	South korea	0	0	5	0	0	0	5
22	Spain	0	0	0	0	0	0.5	0.5
	Total amount (kg)	**3210.4**	**3742.5**	**3022**	**3297.5**	**2636.412**	**2863.27**	**18772.08**
	Total amount (L)	**-**	**-**	**2982.714**	**3254.63**	**2602.1382**	**2826.05**	
	Quota	**382700 kg****	**5782 L**	**5782 L**	**5782 L**	**5782 L**		

** In 2020, the total quota was for rhizome (not differentiated into marc and oil)

Jatamansi Marc								
S. N.	**Country**	**Weight (kg) / Year**						**Total**
		2020	**2021**	**2022**	**2023**	**2024**	***2025 (Till 15 June)**	
1	India	172770	331556	178225	363359	79700	87800	**1213410**
2	Bangladesh	4930	5000	0	1500	500	0	**11930**
3	UAE	36700	0	7000	0	23750	20250	**87700**
4	Pakistan	151065	36260	190480	2500	12000	0	**392305**
	Total	**365465**	**372816**	**375705**	**367359**	**115950**	**108050**	**1705345**
	Quotas	**382700****	**376800**	**376800**	**376800**	**376800**		

Source: DoFSC, CITES Export Permits records 2020-2025
** Quota of 2024 but got export permit in 2025

6.0 Sustainable Harvesting

The government of Nepal is very committed and sensitive to the conservation of CITES species, including *Jatamasi*. It has implemented various legal measures as described in section 4.0.

The DoFSC and respective DFOs regularly organize monitoring missions to regulate the premature and excessive harvesting, illegal collection, and trade of *Jatamasi*. The rotational harvesting of *Jatamasi* at five-year intervals has been practiced. The size of outcrop populations can return to initial levels within five years, only after 10% rhizome harvesting (Ghimire, Gimenez, Pradel, McKey, & Aumeeruddy-Thomas, 2008). While 25% harvesting takes 17 years and 75% harvesting takes 33 years to recover to initial levels, in meadows, populations with harvesting levels >25% are projected to recover in 6 years. Thus, harvesting 10% in rocky outcrops and 20% in meadows in a five-year rotation period, by dividing the area into different blocks within one district, could be considered sustainable.

7.0 New Quota

Nepal, a country characterized by its mountainous terrain, has about 35% of its land covered with high mountains, which are potential sites for *Jatamasi*. Communities living in these areas rely

heavily on gathering wild medicinal plants, including *Jatamasi*, for their income. These groups are often deprived, marginalized, and underprivileged. With challenging climate conditions and limited arable land, avenues for income diversification are scarce. The ban on collecting, processing, and trading *Jatamasi* greatly threatens the livelihoods of rural populations in Nepal. To support both local livelihoods and *Jatamasi* conservation, implementing a sustainable harvesting and fair-trade system is essential.

The suitable adjusted area for *N. jatamansi* is 4,609 Km^2, with a conservative stock rate of 141 kg of air-dried rhizomes per hectare (Smith-Hall, et al., 2023). This means the total stock of *N. jatamansi* is 649,86900 kg or 64987 metric tons of dry rhizomes. According to TGS mentioned in the recent available DFMPs of different districts, as shown in table 4, the total TGS is 24,188.08 metric tons, which is an increase of 4985.05 metric tons compared to the TGS listed in the NDF 2019.

For sustainable harvesting of *Jatamasi*, only 10% of the rhizomes should be collected from rocky outcrops during a five-year rotation, while less than 25% of rhizomes can be harvested from meadows over a six-year rotation period. There is no national-level study on the availability of *Jatamasi* in rocky outcrops and meadows separately. Therefore, DFO should issue 10% of rhizome collection permits for rocky outcrops and 20% for meadows, each with a five-year rotation period. To balance the livelihoods of local people with species conservation, we have adopted 15% of the total TGS as a sustainable harvest, which amounts to 725.6 metric tons of dry rhizomes every year for five-year rotation. Recent DFMPs have shown about a 26% increase in TGS. Consequently, the national harvesting quota will be 725.6 metric tons of dry rhizomes annually, covering both domestic and international needs. Table 6 indicates minimal domestic consumption and demand for *Jatamasi*, with 25.6 metric tons of dry rhizomes per year considered sufficient to meet domestic demand. Similarly, 700 metric tons of dry rhizomes or derivatives of this amount are permitted for international trade each year. This quota can be adjusted based on updated studies of *Jatamasi's* population status in Nepal. Only processed forms such as marc and essential oil of *N. jatamansi* should be permitted for export.

Management of confiscated rhizome: The confiscated rhizome of *Jatamasi* will also be included within the annual quota.

Conversion factors used:

One metric ton	= 1000 kg
Average oil % (v/w)	= 1.4% [since, Range of oil percentage = 0.8% - 2 %]
Specific gravity (density)	= 0.9443 at 23°C
Volume	= Mass / density
Total oil yield	= 1.4% of 700 MT = 9.8 MT ≅ 9800 Liters
Mass of oil	= Volume of oil × Density [since, Density = Mass/Volume]
or Mass	= 9800 × 0.9443 = 9254

∴ Mass of *Jatamasi* oil = 9254 kg

Since, the marc is the residue remaining after oil extraction, the difference in oil quantity (kg) from the total dry rhizome (kg) will determine the quota for Marc (kg).

Thus, Total quantity of Marc = (700000-9254) kg = 690,746 kg

8.0 Conclusions

Nepal is the only mountainous country besides Bhutan that exports *N. jatamansi* and meets the international demand. Research papers and District Forest Management Plans show a high stock of *Jatamasi* and an increase in the TGS over the past five years. The collection, processing, and export of *N. jatamansi* are also major sources of livelihood for local mountainous communities. To balance the livelihoods of local people, international demand, and species conservation, 15 % of the total growing stock- amounting to 725.6 metric tons of dry rhizomes- harvested over a five-year cycle- is considered sustainable. Of this, **25.6** metric tons of dry rhizomes per year can be used domestically, while 700 metric tons- equivalent to **9254** kg of *Jatamasi* oil and **690746** kg of its marc can be allocated for international trade annually.

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Non-detriment finding assessment for *Nardostachys jatamansi* undertaken in accordance with the checklist to assist in making non-detriment findings for Appendix II exports.

Appendix 1: (Summary of harvest regime for plant species)

Species: *Nardostachys jatamansi* (D.Don) DC.

Country (if applicable state or province): Nepal

Date (of making non-detriment finding): 2025

Period to be covered by finding: 5 years

Name:	**Position in Scientific Authority:**
Mr. Saroj Kumar Chaudhary,	Deputy Director General, DPR
Ms. Saroja Adhikari	Senior Scientific Officer, DPR
Dr. Madan Kumar Khadka	Senior Scientific Officer, DPR
Dr. Dipesh Pyakurel	MAPs expert
Mr. Surendra Adhikari	Forest Officer, DFSC
Mr. Yagya Raj Paneru	Research Officer, NHPL
Ms. Kalpana Sharma (Dhakal)	Scientific Officer, DPR

Is the species endemic, found in a few countries only, or widespread?

Found in few countries, like India, Bhutan, China, Myanmar

Conservation status of the species (if known):

IUCN Global status: Critically Endangered

National status: Vulnerable

Type of harvest	Main Product	Degree of control	Demographic segment of population harvested	Relative level of harvest (include number or quantity if known)	Reason for harvest and percentage (if known)	Commercial destination and percentage (if known)
1.3 Non-lethal harvesting of rhizome	Ayurvedic medicine, Incense sticks, Perfumed ointment, Hair oil, Marc and oil.	a) Regulated	a) Immature, b) Mature	382.7 MT per year (2019 Quota)	a) subsistence purpose. b) commercial (15%)	a) Local, b) International trade : Table 7

Appendix 2: Factors for evaluation of threats based on CITES Scientific Authorities: Checklist to assist in making non-detriment findings for Appendix II exports

Scores assigned to each question are highlighted along with detailed explanations/justifications where relevant. Higher scores are indicative of higher risks to the species.

Biological characteristics		
1. Life form: What is the life form of the species?	Annual	1
	Biennial	2
	Perennial (herbs)	3
	Shrub and small trees	4
	Trees	5
2. Regeneration potential: What is the regenerative potential of the species concerned	Fast vegetatively	1
	Slow vegetatively	2
	Fast from seeds	3
	Slow or irregular from seeds or spores	4
	Uncertain	5
N. jatamansi is a slow growing long-lived species that regenerates from seeds as well as from underground rhizomes. Seed germination rate varies from 10%- 80%. The growth of seedlings to reproductive size may take 3-4 years. The survival rates of adults are high (88-100%), while lower for juveniles and seedlings (68-90% and 46-78%, respectively). It is characterized by vegetative growth through the multiplication of a basic module, the ramet, which grows into a dense clump in which the successive ramets are produced very close together.		
3. Dispersal efficiency: How efficient is the species dispersal mechanism?	Very good	1
	Good	2
	Medium	3
	Poor	4
	Uncertain	5

Seeds are passively dispersed in late September by wind, water or gravity.		
4. Habitat: What is the habitat preference of the species?	Disturbed open	1
	Undisturbed open	2
	Pioneer	3
	Disturbed forest	4
	Climax	5
It is an alpine perennial herb found only in the Himalayas. It has been reported on from rocky slopes, rock outcrops, meadows, shrublands, and forests at 3200-5000 m asl.		
National status		
5. National distribution: How is the species distributed nationally?	Widespread, contiguous in country	1
	Widespread, fragmented in country	2
	Restricted and fragmented	3
	Localized	4
	Uncertain	5
As per the Management Plan from different districts, the distribution of *Jatamasi* has been recorded from 28 mountainous districts of Nepal extending from the East to the West. However, various reports, distribution records from the herbarium specimens, and scientific publications show that the species is distributed in 32 districts. The distribution is higher and wider across the Western parts of Nepal.		
6. National abundance: What is the abundance nationally?	Very abundant	1
	Common	2
	Uncommon	3
	Rare	4
	Uncertain	5
The average frequency of the mature plants of *N. jatamansi* in dense areas is 18.31%, varying from 10% (in Thala CF and Thali CF, Humla) to 72% (Mauri CF, Humla). Likewise, the average frequency of the mature plants of *N. jatamansi* in sparse areas is 12.34%, varying from 5% (in Thala CF, Humla) to 66% (Mauri CF, Humla). Similarly, the average density of the mature plants of *N. jatamansi* in dense areas is reported to be		

697.34 individuals per hectare, varying from 111 ind/hac to 1606 ind/hac. Likewise, the average density of the mature plants of *N. jatamansi* in sparse areas is reported to be 300.21 individuals per hectare, varying from 62 ind/hac to 910 ind/hac. Likewise, the field survey done in 2021 by DPR in Manedada, Gaurisankar Conservation Area (GCA) taking the sampling of 5m x5m sizes in different altitudes from 3800 to 3900 m, showed much higher frequency that ranged from 88.9% to 100% and density from 64 to 84 individuals/m^2 in Nepal. This shows that abundance in some areas is very abundant, and in some area it is rare. Thus, National abundance is considered uncommon.		
7. National population trend: What is the recent national population?	Increasing	1
	Stable	2
	Reduced, but stable	3
	Reduced and still decreasing	4
	Uncertain	5
The Total Growing Stock (TGS) mentioned in the recent management plan is higher than the TGS mentioned in previous management plans. This shows that the national population is increasing.		
8. Quality of information: What type of information is available to describe abundance and trend in the national population?	Quantitative data, recent	1
	Good local knowledge	2
	Quantitative data, outdated	3
	Anecdotal information	4
	None	5
Most of the data were extracted from secondary literature, published after 2019 A.D..		
9. Major threats: What major threat is the species facing (Underline the following: over-use/habitat loss and alteration/invasive species/other) and how severe is it?	None	1
	Limited/Reversible	2
	Substantial	3
	Severe/Irreversible	4
	Uncertain	5
Inadequate investment in the research and management of the species are the major constraints leading to the threats for the species conservation. In some places, the over-exploitation and immature harvesting of the species due to high trade demand are considered important threats. Habitat loss due to road construction, landslides and human settlements in very few particular areas.		

Harvest management		
10. Illegal off-take or trade: How significant is the national problem of illegal or unmanaged off-take or trade?	None	1
	Small	2
	Medium	3
	Large	4
	Uncertain	5
Illegal trade is insignificant. The collection is done on the basis of permits provided by Division Forest Offices (formerly District Forest Offices).		
11. Management history: What is the history of harvest?	Managed harvest: Ongoing with adaptive frame-work	1
	Managed harvest: Ongoing but informal	2
	Managed harvest: new	3
	Unmanaged harvest: ongoing or new	4
	Uncertain	5
The trade and harvesting of medicinal plants from forests in Nepal have been regulated and managed since the promulgation of the Forest Act,1993, and the Forest Regulations, 1995. It has made it mandatory to prepare the District Forest Management Plan and estimate species-wise AAH providing due conservation priorities to harvest any forest products. None of the forest products can be harvested more than that approved AAH. Some adaptive measure outlined in the District Forest Management Plan (DFMP) include: Harvesting during the rotation period, permitting species collection only after seed maturation and limiting the collection of rhizomes to a maximum of two-thirds from harvested clumps. Additionally 20% of the total plant clumps must remain untouched to support seed production and ensure natural regeneration.		
12. Management plan or equivalent: Is there a management plan related to the harvest of species?	Approved and coordinated local and national management plans	1
	Approved national/state/provincial management plan	2
	Approved local management plan	3
	No approved plan: informal unplanned management	4
	Uncertain	5

For each district, there is management plan of Forest as well as protected areas. This management plan includes the quantity of harvesting amount of each species found in the forest and also recommend the harvesting season, way to sustainable harvest, approved by province Ministry of Forests and Environment. The Department of Plant Resources (SA of CITES flora) has prepared and approved 10 years conservation and action plans for *Jatamasi* (*N. jatamansi*) in fiscal year 2024.		
13. Aim of harvest regime in management planning: What is harvest aiming to achieve?	Generate conservation benefit	1
	Population management /control	2
	Maximize economic yield	3
	Opportunistic, unselective harvest, or none	4
	Uncertain	5
The harvest regime in management planning aims to help maintain plant populations, support the natural regeneration and prevent overharvesting of *Jatamasi*		
14. Quotas: Is the harvest based on a system of quotas?	Ongoing national quota: based on bilogically derived local quotas	1
	Ongoing quotas: cautious national or local	2
	Untried quota: recent and based on biologically derived local quotas	3
	Market-driven quota(s), arbitrary quota (s), or no quotas	4
	Uncertain	5
CITES secretariat published 382.7 metric tons of dry rhizomes of *Jatamasi* as quota in its website in 19 February 2020 as 2019 additional quota. Since then, secretariat has been publishing the quota of the same quantity each year which is mentioned as precautionary quota in NDF 2019. International trade is based on system of this quota. Thus, we can say harvest is based on system of national cautious quotas.		
Control of harvest		
15. Harvesting in Protected Areas: What percentage of the legal national harvest occurs in State-controlled Protected Areas?	High	1
	Medium	2
	Low	3
	None	4

	Uncertain	5

In Nepal, there are 20 protected areas which include 12 National Parks, one Hunting Reserve, one Wildlife Reserve and six Conservation Areas. Harvesting in National Parks is allowed only for household purpose after taking the legal permission. While in Conservation Area, prescribed quantity in their management plan is allowed to harvest for other than household purpose also. Thus, very low quantity is harvested from the protected areas.

16. Harvesting in areas with strong resource tenure or ownership: What percentage of the legal national harvest occurs outside protected areas, in areas with strong local control over resource use?	High	1
	Medium	2
	Low	3
	None	4
	Uncertain	5

The Forest Acts, 2019 and its Regulations, 2022 have mandated the Divisional Forest Officers to hand over the national forests to adjoining people for its conservation, management and utilization. Such that, 23,601 Community Forest User Groups are managing 2.5 million hectare of forest area (Ecnomic survey, 2023). Most of the *N. jatamansi* habitat of high mountainous regions has been handed over to local community for the conservation, utilization and management.

17. Harvesting in areas with open access: What percentage of the legal national harvest occurs in areas where there is no strong local control, giving de facto or actual open access?	None	1
	Low	2
	Medium	3
	High	4
	Uncertain	5

All the *Jatamasi* available area are under control of either DFO or DNPWC.

18. Confidence in harvest management: Do budgetary and other factors allow effective implementation of management plan(s) and harvest controls?	High confidence	1
	Medium confidence	2
	Low confidence	3
	No confidence	4
	Uncertain	5

Due to insufficient budget and lack of competent human resource, it is difficult for effective implementation of the management plan and harvest control.

Monitoring of harvest		
19. Methods used to monitor the harvest: What is the principal method used to monitor the effects of the harvest?	Direct population estimates	1
	Quantitative indices	2
	Qualitative indices	3
	National monitoring of exports	4
	No monitoring or uncertain	5
DPR, Scientific authority of CITES Plant, is monitoring through the export permit, collection permit and collecting local knowledge as well as studying population status of the species in few places.		
20. Confidence in harvest monitoring: Do budgetary and other factors allow effective harvest monitoring?	High confidence	1
	Medium confidence	2
	Low confidence	3
	No confidence	4
	Uncertain	5
It is difficult to monitor the direct population estimates of the harvested population due to its biological characteristics. DPR, Scientific authority of CITES Plant, is monitoring through the export permit, collection permit and collecting local knowledge as well as studying population status of the species in some places.		
Incentives and benefits from harvesting		
21. Utilization compared to other threats: What is the effect of the harvest when taken together with the major threat that has been identified for this species?	Beneficial	1
	Neutral	2
	Harmful	3
	Highly negative	4
	Uncertain	5
Jatamasi is supporting the livelihoods of local people of mountainous districts of Nepal. Its major threats are overharvesting and immature harvesting in some place for trade purpose. Thus to harmonise the conservation with the livelihood of local people, there is national quota system based on bilogically derived local quotas. Thus the effect of harvest is neutral.		

22. Incentives for species conservation: At the national level, how much conservation benefit to this species accrues from harvesting?	High	1
	Medium	2
	Low	3
	None	4
	Uncertain	5
23. Incentives for habitat conservation: At the national level, how much habitat conservation benefit is derived from harvesting?	High	1
	Medium	2
	Low	3
	None	4
	Uncertain	5
Protection from harvest		
24. Proportion strictly protected: What percentage of the species natural range or population is legally excluded from harvest?	> 15%	1
	5-15	2
	< 5%	3
	None	4
	Uncertain	5
10% to 20% of total growing stock is only allowed for harvesting. Five National Parks (core areas) in Nepal which lie in high mountain strictly prohibit the plant from collection.		
25. Effectiveness of strict protection measures: Do budgetary and other factors give confidence in the effectiveness of measures taken to afford strict protection?	High confidence	1
	Medium confidence	2
	Low confidence	3
	No confidence	4
	Uncertain	5
Nepalese Army personnel stationed in the National parks contribute to the strict protection of the species in protected areas as well as the legal permit system to collect from outside the protected areas, are the effective measures of strict protection of the		

species in Nepal.		
26. Regulation of harvest effort: How effective are any restrictions on harvesting (such as age or size, season or equipment) for preventing overuse?	Very effective	1
	Effective	2
	Ineffective	3
	None	4
	Uncertain	5
Collection permit is provided only after flowering and fruiting season, at the month of October- November.		

Appendix 3: Participants involved during the preparation of NDF.

1. Dr. Sanjeev Kumar Rai, Director General, Department of Plant Resources
2. Mr. Badri Raj Dhungana, Director General, Department of Forest and Soil Conservation
3. Mr. Saroj Kumar Chaudhary, Deputy Director General, Department of Plant Resources
4. Mr. Dhananjay Lamichane, Deputy Director General, Department of Forest and Soil Conservation
5. Mr. Ajit Kumar Karna, Deputy Director General, Department of Forest and Soil Conservation
6. Ms. Saroja Adhikari, Senior Scientific Officer, Department of Plant Resources
7. Ms. Sangeeta Swar, Senior Scientific Officer, Department of Plant Resources
8. Ms. Jwala Shrestha, Chief, National Herbarium and Plant laboratories
9. Dr. Madan Kumar Khadka, Senior Scientific Officer, Department of Plant Resources
10. Dr. Dipesh Pyakurel, Expert.
11. Mr. Surendra Adhikari, Forest officer, Department of Forests and Soil Conservation
12. Ms. Kalpana Sharma Dhakal, Scientific Officer, Department of Plant Resources
13. Mr. Yagya Raj Paneru, Research Officer, National Herbarium and Plant Laboratories
14. Mr. Gopal Sharma, Assistant Botanist, Department of Plant Resources.
15. Ms. Nisha Dulal, Ranger, Department of Forests and Soil Conservation

Appendix 4: List of herbaria of *Nardostachys jatamansi* deposited in National Herbarium and Plant Laboratories (KATH)

Barcode number	Province	District	Locality	Altitude
KATH011244	Bagmati	Ramechhap	Neju - Pasinge Kharka, Ramechhap District, Janakpur Zone, Central Nepal.	3850 m
KATH019690	Bagmati	Sindhupalchok	Helambu, Sindhupalchok District, Bagmati Zone, Central Nepal.	4000 m
KATH023232	Bagmati	Ramechhap	Jata Pokhari (4220m) - Panch Pokhari (4500m) - Botase Kharka (4500m), Ramechhap District, Janakpur Zone, Central Nepal. Lat - 27° 43' N Lon - 86° 25' E	4260 m
KATH023741	Bagmati	Ramechhap	Jata Pokhari (4220m) - Botase Kharka (4500m), Ramechhap District, Janakpur Zone, Central Nepal. Lat- 27° 43' N Lon- 86° 25' E	4220-4500 m
KATH027737	Bagmati	Rasuwa	Yure Kharka - Timbe Kharka, Rasuwa District, Bagmati Zone, E. Nepal.	3700m
KATH027740	Bagmati	Ramechhap	Koshing Kharka, Ramechhap District, Janakpur Zone, E. Nepal. 86°26'E 27°44'N	4050m
KATH034413	Bagmati	Rasuwa	C. Nepal, Bagm,ati zone, Rasuwa district, aroung Jaisuli kund	4295 m.
KATH034418	Bagmati	Dolakha	Beding, Dolakha district	3650 m.
KATH034419	Bagmati	Dolakha	Beding, Dolakha district	3650 m.
KATH034420	Bagmati	Rasuwa	C Nepal: Bagmati zone, Rasuwa district, around Tinbu Kharka	3730 m.
KATH034421	Bagmati	Rasuwa	C. Nepal, Bagmati zone, Rasuwa district, around Seto kund	3930 m.
KATH034422	Bagmati	Dolakha	Beding, Dolakha district	3650 m.
KATH034423	Bagmati	Rasuwa	Laurivinayak (Rasuwa).	3900m.
KATH034430	Bagmati	Ramechhap	Eastern Nepal: Janakpur zone, Ramechhap District., around Jata Pokhari.	4220m.
KATH034440	Bagmati	Rasuwa	Jaisul kunda, Rasuwa district.	4300 m.
KATH034444	Bagmati	Ramechhap	E. Nepal: Janakpur zxone, Ramechhap district, Thare Og- Gyajo La- Neju.	3900 m.

KATH034449	Bagmati	Rasuwa	C. Nepal: Bagmati zone, Rasuwa district, Laurebinayak- Sing Gomba	3950-3450
KATH034450	Bagmati	Rasuwa	Lahuri vinayak	12800 ft.
KATH034603	Bagmati	Rasuwa	Lahuri vinayak, Rasuwa District.	12800ft.
KATH034605	Bagmati	Rasuwa	Ghopte- Gosaithan.	12000ft.
KATH034606	Bagmati	Rasuwa	Laurivinayak.	12,800ft.
KATH034607	Bagmati	Rasuwa	Laurivinayak.	12,800ft.
KATH034608	Bagmati	Gorkha	Gorkha District, Uhiya vdc.	3480m.
KATH034609	Bagmati	Gorkha	Gorkha District, Uhiya VDC.	3940m.
KATH034610	Bagmati	Gorkha	Gorkha district, Uhiya VDC.	3350m.
KATH092181	Bagmati	Rasuwa	Jaisul Kunda, Rasuwa district	4300m
KATH092189	Bagmati	Rasuwa	Jaisul Kunda, Rasuwa district	4300m
KATH108060	Bagmati	Sindhupalchok	Dayangdunge Pahad, Sindhupalchok District	3237 m
KATH108068	Bagmati	Gorkha	Paple Lekh, Gorkha District	3769 m
KATH108069	Bagmati	Gorkha	Paple Lekh, Gorkha District	3769 m
KATH108074	Bagmati	Sindhupalchok	Dayangdunge Pahad, Sindhupalchok District	3237 m
KATH125963	Bagmati	Gorkha	Nepal: Western Development Region: Gandaki Zone: Gorkha Dist., Sama Gaon: north of village, on east side of Budhi Gandaki River, opposite Birendra Kund (Tal).	3,710 m
KATH016392	Gandaki	Mustang	Kaisang, Omang Kharka, Mustang District, Dhaulagiri Zone, Central Nepal.	4200 m
KATH016393	Gandaki	Mustang	Kaisang, Omang Kharka, Mustang District, Dhaulagiri Zone, Central Nepal.	4200 m
KATH016575	Gandaki	Mustang	Kaisang, Omang Kharka, Mustang District, Dhaulagiri Zone, Central Nepal.	4200 m
KATH019437	Gandaki	Myagdi	Ridge SE of Jalja La (3330m), Myagdi & Baglung District, Dhaulagiri Zone, Central Nepal. Lat- 28° 30' N Lon- 83° 14'-15' E	3480 m

KATH019468	Gandaki	Myagdi	Chhau Kharka (3680m)--Tham Kharka(31660m)--Riyu Kharka(2910m), Myagdi District, Dhaulagiri Zone, Central Nepal. Lat; 28° 32' N Long; 83° 13'-15' E	3560m.
KATH023756	Gandaki	Manang	Near Tilicho Lake, Khangsar, Manang District, Gandaki Zone, Central Nepal.	13500 ft
KATH024315	Gandaki	Manang	Phedi, Manang district, Gandaki zone, Central Nepal.	4400m
KATH025812	Gandaki	Mustang	Above Sangda Pass, Mustang District, Dhaulagiri Zone, C. Nepal. 83°42'56.4"E 28°52'43.6"N	4600m
KATH025813	Gandaki	Mustang	Above Sangda Pass, Mustang District, Dhaulagiri Zone, C. Nepal. 83°43'E 28°53'N	4500m
KATH034414	Gandaki	Mustang	W. Nepal. Dhaulagiri zone, Mustang district, Jharkot-Muktinath- Thorong phedi, west side of Thorung La	4550 m.
KATH034415	Gandaki	Mustang	Dhaulagiri zone, Mustang district, Muktinath, Thorong Phedi. (3550-4000 m)	4000 m.
KATH034439	Gandaki	Manang	Ledar, Thorung, Manang district.	4200-5300 m.
KATH034441	Gandaki	Manang	Near Phedi, Manang district.	4200 m.
KATH034443	Gandaki	Mustang	Muktinath- Thorungse	4200 m.
KATH034445	Gandaki	Mustang	Pakkharka, Mustang	4030 m.
KATH034446	Gandaki	Mustang	Pakkharka, Mustang	4030 m.
KATH034447	Gandaki	Mustang	Pakkharka, Mustang	4030 m.
KATH034448	Gandaki	Mustang	Pakkharka, Mustang.	4030 m.
KATH034475	Gandaki	Kaski	Dhumpush	13500 ft.
KATH034477	Gandaki	Mustang	Muktinath, Thorungse	4200 m.
KATH034479	Gandaki	Manang	Churi Lattar, Manang.	4000 m.
KATH034481	Gandaki	Mustang	Muktinath, Thorungse.	4200 m.
KATH034483	Gandaki	Mustang	Muktinath, Thorungse	4200 m.
KATH034601	Gandaki	Manang	Ledar-Thoktung (Manang district).	4200-5300m.
KATH034617	Gandaki	Manang	Central Nepal: Gandaki & Dhawalagiri zones, Manang District, Thorung Phedi(4370m.)- Thorung La (5110m.)- above Muktinath (3720m.).	4180m.

KATH064746	Gandaki	Mustang	W. Nepal: Dhaulagiri Zone, Mustang Distr. Yak Kharka, above Marpha.	3880-4000m
KATH084897	Gandaki	Mustang	Thorungse Phedi, Mustang district	4,000 m
KATH084898	Gandaki	Mustang	Thorungse Phedi, Mustang district	4,000 m
KATH084899	Gandaki	Manang	Manang valley, Manang district	4,100 m
KATH092637	Gandaki	Mustang	Nepal, Mustang District: Muktinath.	3650 - 4200 m
KATH092644	Gandaki	Mustang	Nepal, Dhawalagiri Zone, Mustang District; Kyungchhama Khola (4250 - 4430 m), a valley, ca. 6 km NW. of Lo- Manthang. Collected at Kyungchhama Khola	-
KATH092650	Gandaki	Mustang	Nepal: Dhawalagiri Zone, Mustang District; Ghami (3410 m0 - a hill top (4090 m) - a mountain ridge (4350 m) - Zhaite (Chaite) (3610 m).	4300 m
KATH108070	Gandaki	Manang	Buki Danda, Naso-2 Nachai, Manang District	3776 m
KATH108071	Gandaki	Manang	Buki Danda, Naso-2 Nachai, Manang District	3776 m
KATH108072	Gandaki	Manang	Buki Danda, Naso-2 Nachai, Manang District	3776 m
KATH108073	Gandaki	Manang	Buki Danda, Naso-2 Nachai, Manang District	3776 m
KATH011245	Karnali	Jumla	Chakhure Lekh, Jumla District, Karnali Zone, West Nepal.	3800 m
KATH034417	Karnali	Jumla	Chakhure lekh, Jumla district	3800 m.
KATH034495	Karnali	Jumla	Chakhure lekh, Jumla district.	3700 m.
KATH034505	Karnali	Jumla	Chakhure lekh, Jumla district	3800 m.
KATH034623	Karnali	Jumla	Dhauli Daha (Jumla).	4300m.
KATH073824	Karnali	Dolpa	Near Phoksundo Lake	3,660 m
kath084923	Karnali	Jumla	Chakhure-Likh (Jumla)	3,700 m
KATH108061	Karnali	Dailekh	Danda goth, below Tinchule Lakle, Naumule-3, Dailekh District	3120 m
KATH108062	Karnali	Dailekh	Danda goth, below Tinchule Lakle, Naumule-3, Dailekh District	3120 m
KATH108063	Karnali	Dailekh	Danda goth, below Tinchule Lakle, Naumule-3, Dailekh District	3120 m
KATH108064	Karnali	Dailekh	Danda goth, below Tinchule Lakle, Naumule-3, Dailekh District	3120 m

KATH108065	Karnali	Dailekh	Danda goth, below Tinchule Lakle, Naumule-3, Dailekh District	3120 m
KATH108066	Karnali	Dailekh	Danda goth, below Tinchule Lakle, Naumule-3, Dailekh District	3120 m
KATH108067	Karnali	Dailekh	Danda goth, below Tinchule Lakle, Naumule-3, Dailekh District	3120 m
KATH153576	Karnali	Jumla	W. Nepal: Karnali Province: Jumla District: Patarasi Rural Municapility: Bijara.	4075 m
KATH153577	Karnali	Jumla	W. Nepal: Karnali Province: Jumla District: Patarasi Rural Municapility: Bijara.	4075 m
KATH011243	Koshi	Solukbumbu	Khola Kharka - Rangdu Kharka, Solukhumbu District, Sagarmatha Zone, East Nepal. 86°50'E 27°36'N.	4100 m
KATH016394	Koshi	Sankhuwasabha	Jaljale, Sankhuwasabha District, Koshi Zone, Eastern Nepal.	3800 m
KATH016395	Koshi	Sankhuwasabha	Jaljale, Sankhuwasabha District, Koshi Zone, Eastern Nepal.	3800 m
KATH016564	Koshi	Solukbumbu	Beni Kharka (Dambuk) (3970m) - Thaldarbug (4400m), Solukhumbu District, Sagarmatha Zone, Eastern Nepal. Lat- 27° 40' N 27° 41' N Lon- 86° 35' E 86° 36' E	4000 m
KATH016565	Koshi	Solukbumbu	Beni Kharka (Dambuk) (3970m) - Thaldarbug (4400m), Solukhumbu District, Sagarmatha Zone, Eastern Nepal.	4000 m
KATH023187	Koshi	Solukbumbu	Khola Kharka (4100m) - Rangdu Kharka (3300m), Solukhumbu District, Sagarmatha Zone, Eastern Nepal. Lat- 27° 36'-38' N Lon- 86° 50-48' E	4100 m
KATH024674	Koshi		Chhurchathanga, E. Nepal.	3400m
KATH027320	Koshi	Solukbumbu	Jar Kharka, Solukhumbu District, Sagarmatha Zone, E. Nepal. 86°35'E 27°50'N	4000m
KATH027386	Koshi	Solukbumbu	Thasing Dingma, Solukhumbu District, Sagarmatha Zone, East Nepal. 27°39' N, 86°48' E	3500m

Appendix 5: Sketch of *Nardostachys jatamansi*.

Source: DPR