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Ecosystem Services in Sacred Natural Sites (SNSs) of Uttarakhand: A Preliminary Survey

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ABSTRACT The present work was carried with the aim to document the Sacred Natural Sites in both Garhwal and Kumaon regions of Uttarakhand to access their major ecosystem services benefiting at both regional levels to local inhabitants and globally benefiting environment. The Sacred Natural Sites (SNS) included sacred forests, sacred groves, sacred bugyals and water bodies. A total of 130 SNS were found during the present study located in different areas of Uttarakhand. The surveyed SNS included 55 groves, 44 forests, 24 meadows/bugyals/Kharks and 6 water bodies. With respect to the range of ecosystem services offered by the SNS about 24 percent share goes to the cultural services and 32 percent each for supporting and provisioning services whereas 12 percent services are of regulatory in nature.

INTRODUCTION

Millennium Ecosystem Assessment process has conceptualized the connection between the status of ecosystems and various goods and services provided by those ecosystems. The local people are dependent on ecosystems for variety of services such as provisioning in form of food, water, firewood. The ecosystems have been largely responsible for regulating floods, purifying water, maintaining the temperature, etc. The biological processes such as nutrient cycling, soil formation, etc. are responsible for providing the supporting services to the human society. The human societies are also culturally dependent on the ecosystems for spiritual purposes, aesthetic purposes, recreation, etc. (Fig. 1).

To understand the fundamental meaning of life and develop moral standards towards the community and local habitats cultures have formed values and beliefs to control acceptable behaviour (Laird 1993). Sacred groves (forest) are a group of trees or a patch of vegetation protected by the local people through religious and cultural practices evolved to minimized estruction (Isreal et al. 1997).The sacred groves / forests may consist of multi-species, multi-tier, primary forest or a clump of trees in a near natural condition of vegetation being managed according to local taboos and sanctions that entail spiritual and ecological values (Malhotra et al. 2007). The sacred groves are thought to be rich source of medicinal, rare and endemic plants, as refugia for relic flora of a region and as centers of seed dispersal (Whittaker 1975; Jeeva et al. 2007; Malhotra et al. 2007). Plant wealth and self conservation potential of sacred groves are impressive enough for them to be acknowledged as "mini biosphere reserves" (Gadgil and Vartak 1975).

A number of human societies in Asia, Africa, Europe, America and Australia had long preservation sections of their natural environment as sacred groves (Hughes and Chandran 1998). Historically, attitudes and behaviour towards the environment and sustainable use of resources have been greatly affected and determined by nature worship and spiritual values (Khumbongmayum et al. 2004; Byers et al. 2001).Sacred groves, protected over centuries are often located in regions rich in biodiversity (Bhagwat and Rutte 2006). Consequently they are of great ecological significance and have the potential to provide a variety of ecosystem services (Mourato and Smith 2002). Regulatory functions such as carbon sequestration, nutrient retention, biodiversity, soil conservation, pollination and hydrological cycling can be beneficial not only to local communities but also at national and international levels. Economic valuation of the environment has many uses (Pearce et al. 2002). It has been argued (Adger et al. 2002) that failing to demonstrate economic values of the environment has led to the systematic loss and degradation of the world's eco-

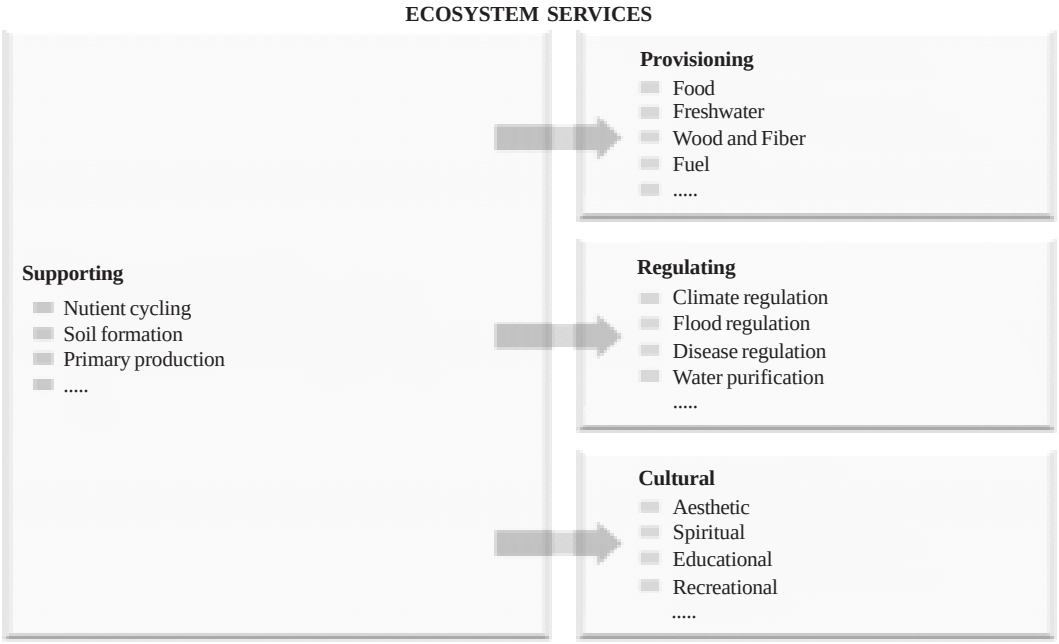

Fig. 1. Classification of ecosystem services developed by the Millennium Ecosystem Assessment
Source: MEA (2005) - Graphic Resources; http://www.maweb.org/en/GraphicResources.aspx

systems. Non-market benefits, that is, non-consumptive use such as the option (future) value for example for genetic resources, existence value and functional value, are often undervalued and can distort economic worth and consequent management policies (Adger et al. 2002).

There have been several studies on sacred groves in India. However, studies on this aspect in Uttarakhand are meager. Sinha and Maikhuri (1998) have described the sacred grove, Hariyali Devi in Chamoli district and Rawal and Dhar (2001) have described the Chiplakedar sacred grove in Askot Wild life Sanctuary, Pithoragarh district, Uttarakhand. Gokhale et al. (1998) have referred to the revival of forests in Pithoragarh region by local communities using religious faith along with reference to variety of ecosystems such as forests, pastures, waterbodies, etc. being conserved by local communities as sacred in India. Recently Negi (2010) documented 168 sacred natural sites including 75 sacred forests, 74 sacred groves, 10 water bodies and 9 pastures in nine districts in Uttarakhand. There are some well known sacred groves in the state which truly represent the wealth of religion based conservation traditions, for example, Binsar, Tarkeshwar, Tapovan, Nagdev, Goldev, Mayavati, Kot, Nandisain, Paabo, Dewal and Chapdon.

Geographical Features

Uttarakhand formerly Uttaranchal, is a state in the northern part of India. It is often referred to as the Land of Gods (*Dçvbhûmi*) due to the many holy Hindu temples and cities found throughout the state, some of which are among Hinduism's most spiritual and auspicious places of pilgrimage and worship. Uttarakhand has a total geographic area of 51,125 km², of which 93 percent is mountainous and 64 percent is covered by forest. Most of the northern parts of the state are part of Greater Himalaya ranges, covered by the high Himalayan peaks and glaciers, while the lower foothills were densely forested till denuded by the British log merchants and later, after independence, by forest contractors. Recent efforts in reforestation, however, have restored the situation to some extent. The Himalayan ecosystem plays host to a large number of animals (including bharal, snow leopards, leopards and tigers), plants and rare herbs. Two of India's largest rivers, the Ganges and the Yamuna originate in the glaciers of Uttarakhand, and are fed by myriad lakes, glacial melts and streams in the region (Negi 1991). According to 2001 India census, Uttarakhand had a population of

approximately 8.48 million. The native people of Uttarakhand are generally called either Kumouni or Garhwali depending on their place of origin in either the Garhwal or Kumaon region.

The government statistics showed that out of total reported area, 64 percent land is under forests, 5.62 percent cultivable waste land, 0.14 percent under current fallow, 1.13 percent other fallow, 5.30 percent not suitable for cultivation, 2.44 percent land other than cultivation, 3.94 percent considered as permanent pasture and grazing land, 3.81 percent under trees, bushes, gardens, excluding cultivation.The state has a good cover of forest. The Uttarakhand Himalayan region is very rich in forest resources and biodiversity. The plant diversity is extremely rich in the regions ranging from the valleys to the highly elevated alpine meadows. To ensure proper management of forests, the forest area is divided into three categories: reserve forests, constituting 70 percent of the area under forests; civil and soyam forests (about 22 percent of the total forest area); and Van Panchyats accounting for about 8 percent of the area under forests. Thus the crucial aspect of the forest management in the region is the conservation-based forestry that meets the livelihood needs of the local people.

Objectives of the Work

The present work was carried with the aim to document the Sacred Natural Sites in both Garhwal and Kumaon regions of Uttarakhand to access their major ecosystem services benefiting at both regional levels to local inhabitants and globally benefiting environment. The SNS included sacred forests, sacred groves, sacred bugyals and water bodies.The documentation covered major aspects like socio-economic status of associated villages with SNS, Management system, ecosystem services available in the SNSs, Dependence of local inhabitants and their dominant vegetation.In Kumaoun region, Pithoragarh, Bageshwar, Almora and Champawat districts were surveyed while in Garhwal region Pauri, Chamoli, Rudraprayag, Dehradun and Tehri districts were surveyed.

The governance of natural resources in India is increasingly growing towards participatory systems and in the context of Uttarakhand the Van Panchayats have been one of the oldest recognized forest management systems. The biodiversity rich sacred natural sites exist in Uttarakhand without any recognition as a tool for conservation management and the present work attempts to explore the compatibility of these systems with the prevailing policy options.

METHODOLOGY

A Reconnaissance survey was carried out in both Garhwal and Kumaon regions of Uttarakhand to know the possibility of occurrence of SNS with the help of Uttarakhand Forest department, Van Panchyat committees, NGOs, Temple authorities, village level institutions and other stakeholders. After preliminary investigation an intensive field survey was done to documentthese SNS. For documentation purpose, a semi-structured questionnaire was prepared. Questionnaire covered aspects such as Village profile, Features of sacred elements included area of SNS, Management system, Taboo system, festivals associated, dominant vegetation, ecosystem service assessment and future of these SNS. Discussions were held with the local inhibiting communities including both genders and mostly older age class to cover major aspects of questionnaire. Observations were also made personally, and pertinent details recorded in association with the locals of each grove.

RESULTS

Distribution of SNS

A total of 130 SNS were found during the present study located in different areas of Uttarakhand (Fig. 2). The surveyed SNS included 55 groves, 44 forests, 24 meadows/ bugyals/Kharks and 6 water bodies. Maximum number of these SNS is found in Pithoragarh district (Fig. 3) of Kumaoun region, where large numbers of *Van Panchyats* are offered to local deities to prevent them from encroachment and deforestation.The number of SNS captured in surveyed districts is also proportional to the efforts made in the respective districts based on the logistics and available time. Hence the highest numbers of sites in Pithoragarh is the result higher efforts in the region. The knowledge of such sites in the state of Uttarakhand is extremely locally restricted to given village at

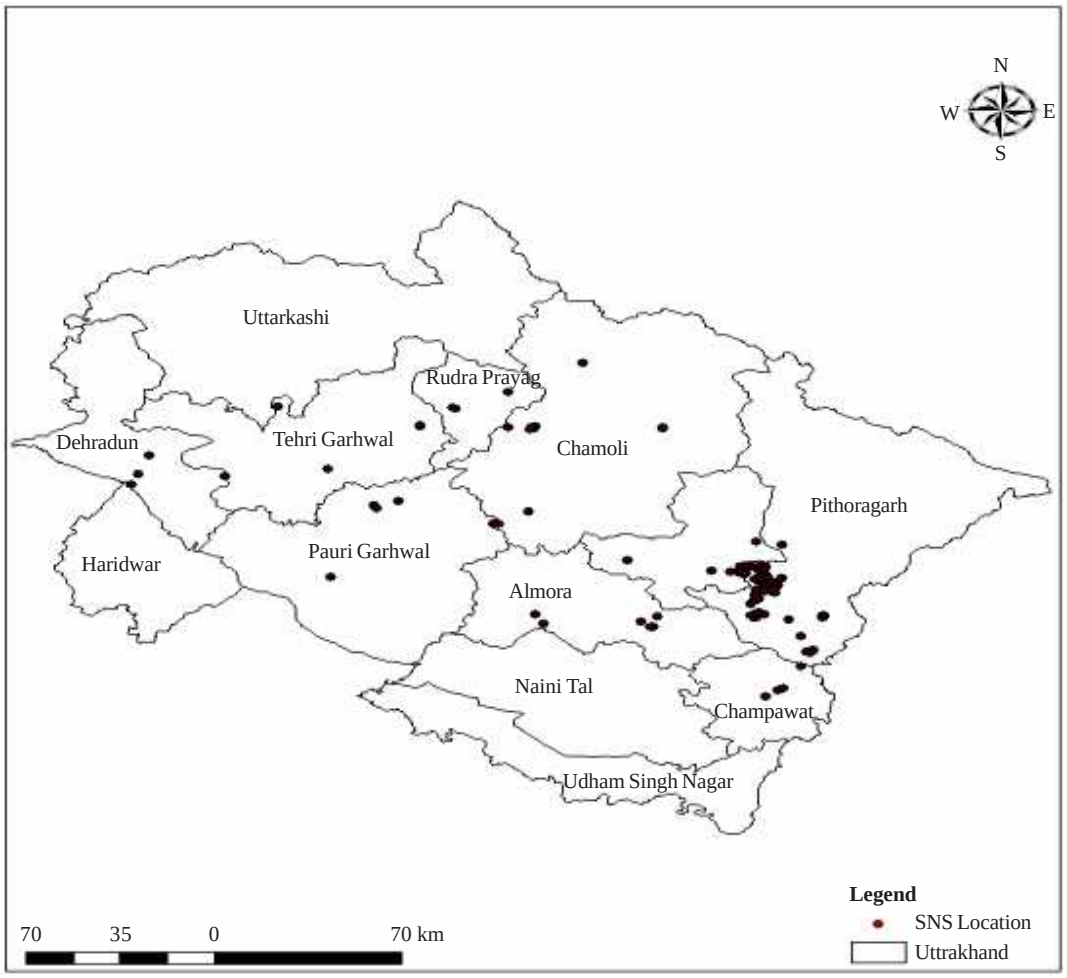

Fig. 2. Location of surveyed SNS in Uttarakhand

times. The interactions with naturalists also had a limited success in terms of identifying the locations which could be potential SNS.

Ecosystem services and SNS in Uttarakhand

Among the surveyed SNS 103 are used by communities for different substance purposes/ ecosystem services (Table 1). Various ecosystem services like fuelwood, fodder, small timber, water source, livelihood opportunities, soil conservation, lowering of temperature and NTFP collection are derived from SNS. In the present study, 45 SNS are used for collection of fuelwood and 49 for fodder collection. In 41, SNS biomass extraction in form of dead/dry wood, fallen twigs, and leaf litter is allowed, whereas 10 SNS are used for collection of pine needles for bedding purpose in cowsheds during winter season. Source of water from 37 SNS are used by communities for purposes like drinking, irrigation. NTFP collection in the form of medicinal plants, wild fruits, grasses etc. for subsistence and commercial purposes are allowed in 21 SNS, whereas 8 SNS provide livelihood opportunities in the form of tourism sites. Soil conservation is the main ecosystem service in 8 SNS, whereas 9 SNS are serving the purpose of wildlife conservation. Beautification of area and shelter during summer season services are identified in 9 SNS (Fig. 4).

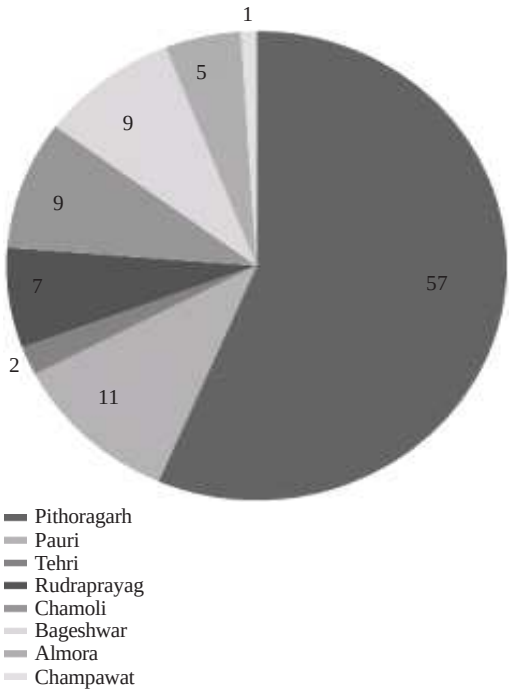

Fig. 3. The distribution of SNS in different districts of Uttarakhand

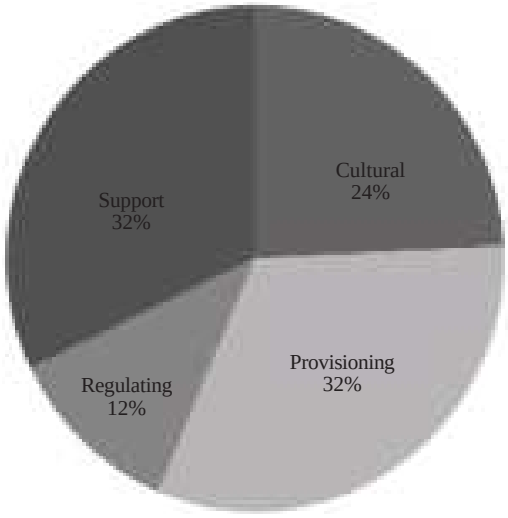

Fig. 5. Ecosystem services provided by the SNS in Uttarakhand

Figure 5 suggests the classification of ecosystem services offered by SNS in the framework of Millennium Ecosystem Assessment. With respect to the range of ecosystem services offered by the SNS about 24 percent share goes to the cultural services and 32 percent each for supporting and provisioning services and 12 percent services are of regulatory in nature. It probably suggests that the definition of sacredness by the local communities has a strong influence of material dependence of local communities on the sites.

DISCUSSION

The Van Panchayats in Pithoragarh districts have been experimenting with religious faith to be used to conservation of natural resources for

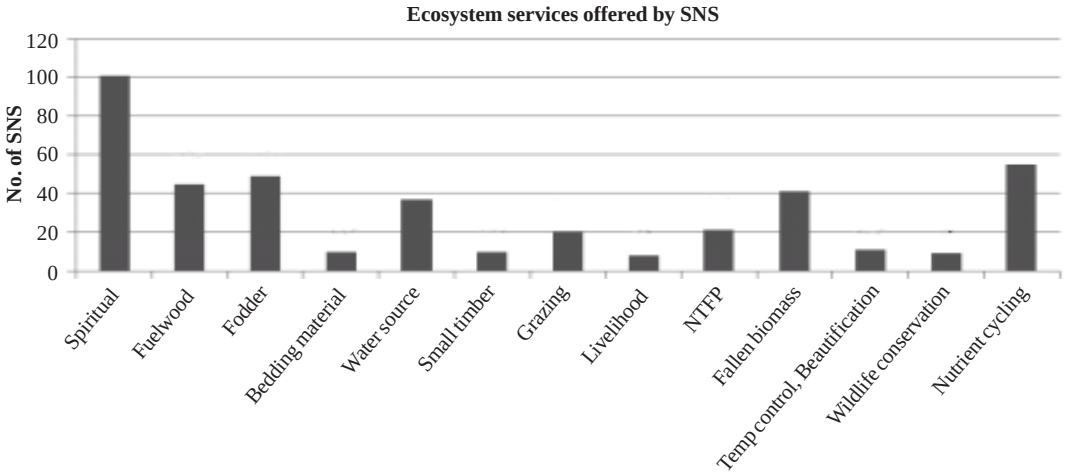

Fig. 4. Number of SNS providing different ecosystem services

Table 1: SNS in Uttarakhand and ecosystem services offered

S. No.	*Names of SNS*	*SNS type*	*Village*	*District*	*Ecosystem Services*
1	BinsarMahadev	Forest	Soni (Devlikhat)	Almora	Fuelwood, fodder, pine needles for bedding material and water source
2	Sourd grove	Grove	Sourd	Almora	Dry leaves (needles) of *Chir –Pinusroxburghii*
3	Chitaye	Grove	Chitaye	Almora	Pine needles
4	Goludevta (Chitaye)	Grove	Chitaye	Almora	Pine needles
5	Samgadi forest	Forest	Simgadi	Bageshwar	Fuel wood, fodder and dry wood collection, water source
6	Magedha forest	Forest	Magedha	Bageshwar	Fuel wood, fodder and dry wood collection , water source
7	Patal van panchyat	Forest	Patal	Bageshwer	Fuel wood, fodder and dry wood collection, refugee to wild life
8	Sheri (hudam) van panchyat	Forest	Sheri	Bageshwer	Fuel wood, fodder and dry wood collection , water source
9	Majgaun van panchyat	Forest	Majgaun	Bageshwer	Fuel wood, fodder and dry wood collection
10	Jakani van panchyat	Forest	Jakhni	Bageshwer	Water source, fuelwood, small timber, fodder
11	Mahrodi forest	Forest	Mahrodi	Bageshwer	Fuelwood, fodder
12	Siddhenathkhera	Grove	Sangar	Bageshwer	Wild fruits, fuelwood, fodder
13	KuniyaTalabBaijnath (Machhyar)	Waterbody	Baijnath	Bageshwer	Livelihood source for local inhabitants
14	Valley of flowers	Meadow	Bhyundar	Chamoli	NTFP collection, water source, income generation source
15	DograBugyal	Meadow	Siroli	Chamloi	Grazing, NTFP collection, water source
16	Hans Bugyal	Meadow	Siroli	Chamoli	Grazing, NTFP collection, water source
17	KandeBugyal	Meadow	Siroli	Chamoli	Grazing, NTFP collection, water source
18	Latakharak	Meadow	lata	Chamoli	Grazing, collection of NTFPs
19	Sanikharak	Meadow	Lata	Chamoli	Grazing, collection of NTFPs
20	Patharkhani	Meadow	Mehargoan Ramla and Gandiyal	Chamoli	Grazing, collection of NTFPs
21	Attarmani ashram	Waterbody/ grove	Siroli	Chamoli	Water source
22	Amrit Ganga	Waterbody	Siroli	Chamoli	Water source
23	Maldeshwar temple	Grove	Jayadagaun	Champwat	Water source
24	Tarkeshwar	Forest	Aangni	Pauri	Collection of Fuelwood, fodder, and other NTFPs
25	Nagdevmandir	Forest	Paurigaon (Nagdev-mandir)	Pauri	Water source, fuelwood, fodder and small timber
26	Kaundiyolia	Forest	Paurigoan	Pauri	Fuelwood, fodder
27	Searapani	Meadow	Dhanda,	Pauri Touleu	Grazing, NTFP collection
28	Binu	Meadow	Chaunda, Than, Sundargoan	Pauri	Grazing, NTFP collection
29	Rasalpani	Meadow	Gadigoan	Pauri	Grazing, NTFP collection
30	Pateldhar	Meadow	Jaintee	Pauri	Grazing, NTFP collection
31	Udhiarminthalbanar	Meadow	Dhang	Pauri	Grazing, NTFP collection
32	Aaglaga	Meadow	Lambadi	Almora	Grazing, NTFP collection
33	Khali	Meadow	Jaintee	Pauri	Grazing, NTFP collection
34	Mangrajabar	Meadow	Sunder goan	Pauri	Grazing, NTFP collection
35	Gadhnar	Meadow	Toluee	Pauri	Grazing, NTFP collection
36	Lothal sacred forest	Forest	Lohathal	Pithoragarh	Water source, Fuelwood, fodder, dry and felled timber
37	Panku van panchyat	Forest	PankuSehra	Pithoragarh	Fuelwood, fodder, felled biomass
38	Hanuman mandir Nagila Gaun	Forest	Nagila	Pithoragarh	Dead, dry wood, fodder, fuel wood , water source
39	Khandhar forest	Forest	Khandar	Pithoragarh	Fuel wood, fodder and dry wood collection, grazing and water source
40	Dasholi van panchyat	Forest	Dasholi	Pithoragarh	Dead, dry wood, fodder, fuel wood
41	Van panchyatSangourh	Forest	Sangourh	Pithoragarh	Fuel wood, fodder and dry wood collection
42	Donu van panchyat	Forest	Donu	Pithoragarh	Fuel wood, timber, medicinal plants and other forest produce

Table 1: Contd.....

S. No.	*Names of SNS*	*SNS type*	*Village*	*District*	*Ecosystem Services*
43	KalisanBubhu	Grove	Sainar	Pithoragarh	Dry and dead wood, leaf litter
44	Kalinag grove	Grove	Sainar	Pithoragarh	Fruits from *Terminaliachebula* for treatment of cough disease
45	Karala village	Forest	Karala	Pithoragarh	Timber, NTFPs, fuel wood and water source
46	GulluDevta temple	Grove	Matoli	Pithoragarh	Fallen dead and dry wood
47	Shivalya	Grove	Kanera	Pithoragarh	Fuelwood, fodder and small timber
48	Kanera forest	Forest	Kanear	Pithoragarh	Fodder, firewood, small timber, NTFPs and water source
49	Kaushaliya Devi temple	Grove	Hudati	Pithoragarh	Soil and water conservation, shade during summer
50	NagimalMandir	Grove	Kanda	Pithoragarh	Fallen biomass
51	Durga Devi Mandir	Grove	Puranathal	Pithoragarh	Soil and water conservation, drinking and irrigation water purpose.
52	ShriHarDevta	Grove	Gathtir	Pithoragarh	Soil and water conservation, drinking andirrigation water purpose.
53	MunkattaNagimal grove	Grove	Chankana	Pithoragarh	Fuelwood, fodder and dry and fallen biomass
54	Maitoli forest	Forest	Maitoli	Pithoragarh	Firewood, timber, fodder, water
55	NagimalDevta Grove	Grove	Belkot	Pithoragarh	Fuelwood, fodder and fallen dead and dry material
56	Baghora grove	Grove	Lingurani	Pithoragarh	Soil and water conservation and beautifies the village.
57	Shivalga	Grove	Jagthali	Pithoragarh	Fuelwood, fodder and small timber
58	ChurmalDevta	Grove	Jagthali	Pithoragarh	All fallen biomass
59	Badet forest	Forest	Badet	Pithoragarh	Fuel wood, fodder and dry wood collection
60	Futsil forest	Forest	Futsil	Pithoragarh	Fuel wood, fodder and dry wood collection
61	Van panchyatUdiyari	Forest	Udaiyari	Pithoragarh	Fuel wood, fodder and dry wood collection
62	Gruburani forest	Forest	Gruburani	Pithoragarh	Fuel wood, fodder and dry wood collection
63	Kandey forest	Forest	Kandey	Pithoragarh	Fuel wood, fodder and dry wood collection, water source
64	Odd Van panchyat	Forest	Odd	Pithoragarh	Water source,fuelwood, fodder and dry wood collection
65	Pingnath Temple Barsayat	Grove	Barsayat	Pithoragarh	Soil and water conservation
66	ChaudaKhal Van	Forest	JakhRawat	Pithoragarh	Fuel wood, fodder and dry wood collection, source of water
67	Gopjoshi	Grove	Bararh	Pithoragarh	Cool temperature and beautification of village
68	Sain grove.	Grove	Bhandari-goan	Pithoragarh	Water source
69	Van panchyatJadapani	Grove	Jadapani	Pithoragarh	Water source
70	Koteshwar (cave)	Grove	Koteshwar	Pithoragarh	Income from tourists, beautification of village, livlihood occupation of villagers
71	Chitgal forest	Forest	Chitgal	Pithoragarh	Fuel wood, fodder and dry wood collection, water source
72	Rameshwarezar	Forest	Bhattigaun	Pithoragarh	Fuel wood, fodder and dry wood collection
73	Khalmanu forest	Forest	Kuvarali	Pithoragarh	Fuel wood, fodder and dry wood collection
74	Tripura sundari	Grove	Kuvarali	Pithoragarh	Beautification of village
75	Naulingmandir	Grove	Bhatti gram badav	Pithoragarh	Fuelwood, fodder and other fallen biomass
76	Kotgyari Devi (Kokila Devi)	Grove	Kotgyari	Pithoragarh	Water source, biomass collection outside temple boundary
77	ChhurmalDevtamandir	Grove	Tana	Pithoragarh	Shade and lowering of temperature during summers
78	AeradikaJangal	Forest	Aeradi	Pithoragarh	Fuel wood, fodder and dry wood collection, water source
79	Saemmandir	Grove	Chitgual	Pithoragarh	Fuel wood, fodder and dry wood collection, water source
80	Laxminarayanmandir	Grove	Lachoma	Pithoragarh	Water source
81	Chaharmaldevta	Grove	Lachima	Pithoragarh	Water source
82	Mahakalimandir	Grove	Rawal	Pithoragarh	Fuelwood, fodder and small timber
83	Chhurmaldevta	Grove	Jajhat	Pithoragarh	Dry pine needles, dry leaves
84	Hanuman mandirhatt	Grove	Hatt	Pithoragarh	Fuelwood, fodder and small timber
85	Chammunda Devi	Grove	Hanera	Pithoragarh	Water sources inside and fallen needles of deodar
86	Khadkayamanu	Grove	Satgarh	Pithoragarh	Shade during summer and role in soil conservation

Table 1: Contd.....

S. No.	*Names of SNS*	*SNS type*	*Village*	*District*	*Ecosystem Services*
87	Malyajungal	Forest	Malya	Pithoragarh	Fuel wood, fodder and dry wood collection, water source
88	Kalinagh	Grove	Satgarh	Pithoragarh	Shade during summer
89	Kashindevta	Grove	Satgarh	Pithoragarh	Lowering of temperature and beautification of area
90	Vetaldevta	Grove	Satgar	Pithoragarh	Dry and fallen biomass, soil conservation and beautification of village
91	Dalani Van panchyat	Forest	(Undane) Badabe	Pithoragarh	Fuel wood, fodder and dry wood collection, water source
92	Lateshwar baba	Grove	Badabe (garajatok)	Pithoragarh	Source of water
93	Malkigayar	Forest	Salkhola	Pithorgarh	Fuel wood, fodder and dry wood collection
94	MadmaheshwarBugyal	Meadow	Gondar	Rudripriyag	Grazing, income for livelihood activities, collection of medicinal plants
95	Tungnath	Meadow	Makumat	Rudripriyag	Grazing, income source, by tourists
96	Genthena water body	Waterbody	Genthena	Rudripriyag	Drinking and irrigation water
97	Badhanital	Waterbody	Badhanital	Rudrepriyag	Water conservation and beautification of village
98	Nauntuli Devi	Forest	Ravigram	Rudripriyag	Water source, fuelwood, dead and fallen timber
99	Jameshwar sacred forest	Forest	Jamu	Rudripriyag	Water source,grazing, medicinal plant, fuelwood and fodder collection
100	Hariyalidevi	Forest	Kodima	Rudripriyag	Wild edible fruits, medicinal plants, fuelwood, fodder and water source
101	Banjunamitok	Forest	Chahganda	Tehri	Fuelwood, fodder, small timber, wild edible fruits and a source of water
102	Chanderbadni	Forest	Pujargoan	Tehri	Fuelwood, fodder, timber, small timber for agricultural implements.

past few decades. Gokhale et al. (1998) reported the phenomenon earlier and the system of offering Van Panchayat forests to the local deities continues in form of a kind of forest management. The process which is locally referred as Devi Pe chadhye gaye jungle (Forests offered to local goddess) provides a valuable connection between the various aspects of the ecosystem services offered for the human well-being. The sacredness of the Mother Nature is not only valued in terms of reverence in form of protection but is also managed with respect to the local requirements. In most of the Van Panchayats the forests compartments are closed for a period of five years and then opened for harvesting with the blessings of the deity. Figure 4 is quite elaborative in providing the understanding of sacredness with respect to the human well-being. The Pithoragarh process strengthens the importance of religious faith in restoring the natural systems to sustain the livelihoods of the local communities.

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