NON-TIMBER FOREST PRODUCE: UTILIZATION, DISTRIBUTION AND STATUS IN THE KHANGCHENDZONGA BIOSPHERE RESERVE, SIKKIM, INDIA.

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ABSTRACT

Mountains are important repository of valuable resources and provide services to one third of the humanity living in this planet. Sikkim Himalaya is endowed with wide variety of non-timber forest produce (NTFP). The ethno-cultural fabrics of this tiny state are rich in traditional practices. As a result, the people living in the Khangchendzonga complex use these natural resources in various ways for their subsistence. The study recorded 94 odd numbers of NTFPs from the area. Above 50% of these species are marketed in the local *Hats* with a minimum price, which otherwise have good potential in local economy. About 10% of the total species distribution was found to be a concern for conservation. Some of the high value medicinal plants have potential for value addition as well as domestication. Therefore, a strategic plan is needed for conservation of these valuable resources and for sustainable development.

KEYWORDS: *Non timber forest products (NTFPs), uses, market, status, Sikkim.*

Allium wallichii (Jungali Piyaj)- Thangsing, Sikkim

Aconitum ferox (Bikhuma-High medicinal value, use in diaphoretic, diuretic, expectorant, febrifuge, diabetes)

INTRODUCTION

Mountains are complex and fragile ecosystems that cover almost a quarter of the earth's land surface and host 12 percent of its people (Price 2003). Due to the extreme heterogeneity of environments (climates and soils), rapid elevational changes (altitudinal vegetation belts), and variable directional orientation (aspect), the mountains have diverse vegetation and varied microclimatic and ecological conditions (Hamilton 2002). As a consequence, mountains exhibit high biodiversity, often with sharp transitions (ecotones) in vegetation sequences, and equally rapid changes from vegetation and soil to snow and ice (Korner 2004; Viviroli and Weingartner 2004). In addition, mountain ecosystems are often rich in endemics, because many species remain isolated at high elevations compared to lowland vegetation communities that can occupy climatic niches spread over wider latitudinal belts. It is equally important as 'water tower' due to the highest accumulation of snow and ice outside Polar Regions: source of ten major rivers in Asia such as Indus, Bramhaputra, Salween, Yangtze etc. that collectively provide water for about 1.3 billion people (Schild 2008; Xu et al. 2009). Thus, they are the last bastions of wild nature "islands" in a sea of transformed lowlands and provide a number of very important ecological functions (Hamilton 2002). These functions contribute to half of the humanity for their wellbeing well beyond the immediate vicinity, benefiting entire river basins (Korner and Ohsawa 2005).

Realizing the importance of mountains as an ecosystem of crucial significance, the Convention on Biological Diversity (CBD) specifically developed a programme of work on 'Mountain Biodiversity' to reduce the loss of mountain biological diversity by 2010 at global, regional, and national levels in 2004 (Secretariat to CBD 2004; Sharma and Acharya 2004). However, the mountains are still facing enormous pressures from various drivers of global change including climate change (Chettri et al. 2010; Nogues-Bravo et al. 2007; Tse-ring et al. 2010).

The Himalaya offers an array of forest types with diversity in forest produce such as medicine, vegetables, nuts, wild edible fruits and decorative as non-timber forest products (NTFPs) from time immemorial. The folk medicinal practices are quite common among the ethno-cultural groups of this region (Biswas 1956). The knowledge of flora and fauna and their value as NTFP is rich among the ethnic groups of this region (Negi et al. 2002; Mahanta and Tiwari 2005; Negi and Palyal 2007; Bantawa and Rai 2009) During the course of human civilization nearly 3000 plants species have been used as food but only about 150 species have been cultivated (NRC 1982) and less that 10 plant species are meeting over 90% of the world food demand (Wilkes 1981). Many such food resources and valuable plants are still to be explored (Mohan Ram 2000). In Sikkim alone, about 190 wild edible plants are available and some of them have high potential for their use as food (Sundriyal and Sundriyal 2001; a & b). Therefore, exploration and listing of plants and animals with their ethnobiological value are important for knowing and evaluating human-plant relationship, potential for their use in day-to-day life and for proper management (Alcorn 1981a,b). The objective of this chapter has two folds. The chapter present the review work on NTFPs of Sikkim and brings the extensive survey of NTFPs and their regular monitoring undertaken by the G.B. Pant Institute of Himalayan Environment and Development, Sikkim Unit as a part of Sikkim Biodiversity and Ecotourism Project.

CURRENT STATE OF THE NTFP RESOURCES IN THE SIKKIM HIMALYA

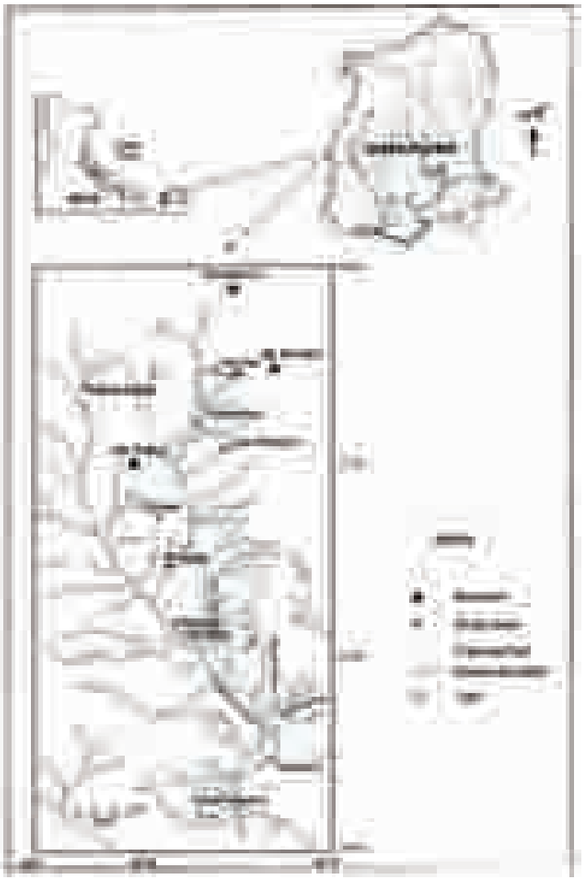
NTFPs are biological products and services, except timber, sourced mainly from forests and similar land uses such as wastelands, grasslands, agro/farm forests and marginal lands. Fuelwood is generally excluded from the purview of NTFPs as it is assumed that fuelwood market systems are already well understood and do not require the same degree of analysis as the common NTFPs such as medicinal plants, bamboo, cane and wild foods. They are sometime referred

collectively as the `Cinderella' species since their potential is yet to be unveiled and utilized. In general, forest fringe communities and upland farmers are more dependent for their livelihood on NTFPs than lowland farmers for: a) earning cash income; b) satisfying household needs such as fodder, medicine, shelter, and other household goods; 3) sourcing traditional agricultural inputs such as leaf litter, wild plants, small tools and water; and 4) obtaining supplementary foods such as roots, tubers, vegetables, fruits and grains for the family. Due to their physical remoteness, linkage between local community and forestry is traditional and they are economically and ecologically inseparable from each other. Their dependency on the forest resources is both historic and cultural so much so that they constitute an integral component of the forest ecosystem of the region. The forest and people in the state of Sikkim and elsewhere are inseparable and therefore, very rightly, they consider the forest as their nourishing mother (Sharma et al 1992).

Sikkim is a small state of India that falls in the eastern Himalaya (27°3'47" to 28°7'34"N lat and 88°3'40" to 88°57'19"E long). The total area of the state is 7096 km^2, which forms just 0.2% of the total geographical area of the country. Sikkim is rich in cultural and biological diversity. Lepchas, Bhutias, Limbus and Nepalese are the main ethnic groups of Sikkim, and they differ from each other in their food habits and lifestyle (Subba 2002).

Besides growing a few crops, people depend on a large number of NTFPs to meet fodder, medicine, fiber and other needs (Sharma et al. 1992; Chettri et al. 2005). However, the documentation on NTFPs from the state is limited compared to other Himalayan states of India (Chhetri 2004; Chettri et al. 2005; Majumdar et al. 2006; Pant et al. 2009; Tamuli and Sharma 2010). In the recent decades, the state has gone through an economic transition phase, and due to population growth and increase in demands of various products, the natural resource exploitation has reached an unprecedented level (Sharma et al 1992; Sundriyal et al. 1994; Sundriyal and Sharma 1996; Chettri et al. 2002). Most of the documented researches were on medicinal plants (Sundriyal and Sharma 1995; Chanda et al. 2002; Maity et al. 2004; Hussain and Hore 2007; Pradhan and Badola 2008; Bharati and Sharma 2010). Thus, the other forms of NTFPs such as fodder, fiber, dyes etc. are practically dealt with ignorance.

Figure 1. A map showing the Sikkim state and the Yuksam-Dzongri trekking trail of west Sikkim.

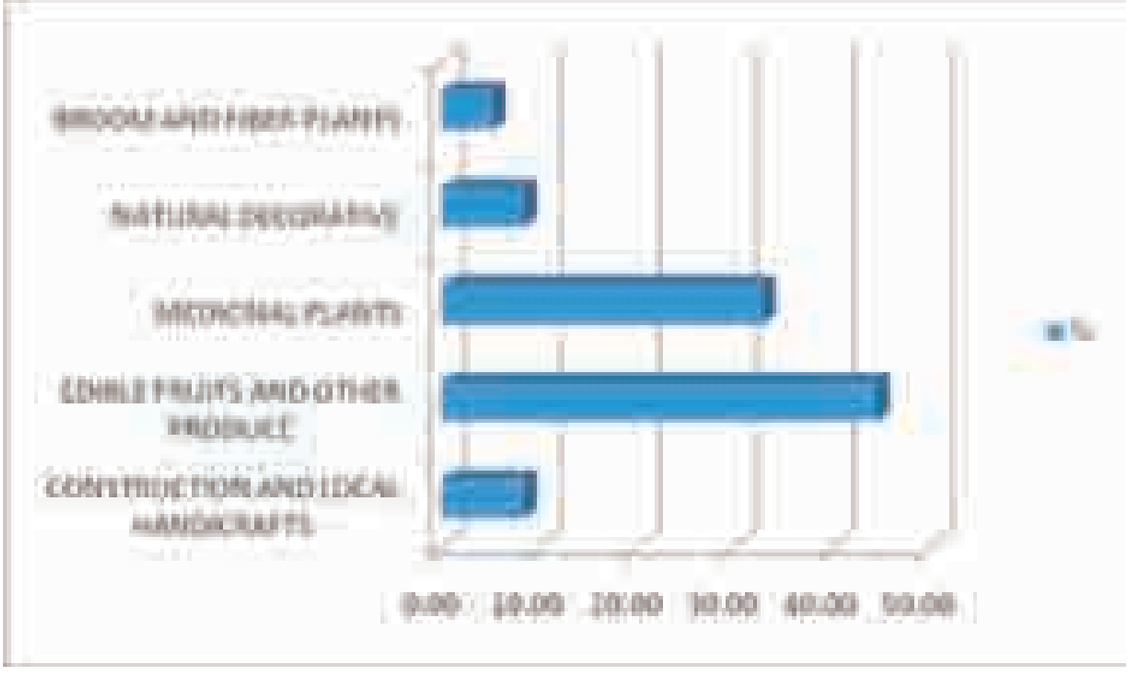


We present here the research done on NTFPs from the Yuksam-Dzongri trekking corridor of the Khangchendzonga Biosphere Reserve (KBR). The Yuksam-Dzongri trekking corridor (26 km long) encompasses from 1780 m to 4000 m amsl. The trail passes through Sachen, Bakhim and Tshoka in the southwestern part of KBR in Sikkim, India. Yuksam is a trailhead for this corridor and leads through Tshoka, Dzongri, Thangsing to the Khangchendzonga Base Camp and Gocha La in West Sikkim. Yuksam (1780 m) has 11 settlements with 274 households comprising 1573 number of individuals. One settlement with 8 households resides inside the KBR at Tshoka (3000 m) along the trail. (Figure1). The area is rich and pristine in its forests resources and treasured with innumerable non timber forest products (Chettri 2000). Different ethnic groups like Subbas, Bhutias, Lepchas, Nepalis and Tibetan Refugees live at the buffer area of the Reserve. Due to the mountainous terrain and difficulties in communication, communities living in the area uses large number of plants as foods, vegetables, ingredients for house construction and medicines to cure serious diseases, sprains, cuts and fractures since ancient time. NTFPs available in these forests are important alternative to livelihood of the local communities. They consist of house construction materials, edible fruits and vegetables, medicinal plants, fibre, broom grass and natural decorative.

The methods employed in this study were designed with the purpose of providing baseline information on the use of plants species in the local systems and their status in the study area. Extensive household level surveys were conducted in 14 villages with structured (preset formats) with queries on names of the non-timber forest products (NTFPs) used in their daily life. In each village at least the 10% of the total households were covered. Special emphasis was also given for survey in the local *hats* (markets) for their market prices. This information was then cross-checked through informal but focus group discussion with the communities, specially the elders and local traditional medicine practitioners. The final list of species was then used in the field surveys to cross-check their altitudinal distribution and status. The altitudinal distribution of the enlisted species and their population were recorded from systematic survey as part of the other studies made in the same study area (see Singh 2000; Chettri et al. 2002; Chettri et al. 2005).

Ninety-four species of NTFPs were recorded from the survey and cross-checked their distribution and status in the study area. All 94 species were categorized into five major categories. About 8% of the enlisted species were found to use for construction purposes; 45% species as wild edibles; 33% as medicinal purpose, 8% as decorative and 5% as fibre and incense (Figure 2). Among these, above 50% were found marketed and majority of them were wild edibles and medicinal herbs (see appendix). In the following section, we present the research results for each of these NTFP categories with discussions.

Figure 2. A bar diagram showing the proportion of enlisted 94 species use for major categories as NTFPs



CONSTRUCTION AND LOCAL HANDICRAFTS

Bamboos (*Dendrocalamus* spp) were widely used by the local inhabitants for construction of houses, bridges and fences other that timber and stone. In Yuksam and Khecheopalri Watershed, there are more than eight varieties of bamboos available. Most of the bamboos are cultivated except a few (*Arundanaria intermedia, A. racemosa, Cephalostachium* sp.) and some bamboos (*A. hookerian, Bambusa nutans*) though cultivated by the local people are also found in community as well as government forests. These bamboos are found scattered in steep slopes of community forests in lower elevations and in reserve forests at higher reaches ranging from 1700 m to 2750m. The economic importance of bamboo is very high as they are widely used for different purposes. Leaves are used as excellent fodder for livestock, stems are extensively used for house construction, handicraft preparation (making mats, baskets, decorative pieces) and young shoots are used as vegetables or used in preparation of pickles.

EDIBLE FRUITS AND OTHER PRODUCE

Wild edible plants that are found in the forests and in the private lands offer a variety of fruits to the local people as nutritional diet. These fruits are also a good source of fruit for wildlife and birds. Some of the species such as *Rhus semialata, Litsae citrata* and *Juglan regia* happens to be a good medicinal value. The leaves of *Machilus edulis*, *M. odoratissima*, *Basia butyracea* and *Bauhinia variagata* offer a good fodder for cattle. *Machilus edulis*, *M. odoratissima* have also been seen to rehabilitate drier rocky hilly slopes. There are a number of trees in forests, whose young shoots (*Pentapanax leschenaultii*), leaves (*Girardinia palmate, Urtica dioica*)) and flowers (*Tupistra nutans*) are eaten as vegetables or made pickles. Some of them are also source of medicines that are widely used by the local practitioners. About seven edible varieties of mushrooms were recorded from the area and most of them are found on naturally dead woods during the monsoon season. These mushrooms form a part of delicacies in the food of local people, and are also a good source of nutrition.

Panax pseudoginseng a plant with haemostatic property, Lachung, Sikkim

There are varieties of *Diplazium* spp. (wild ferns) used as vegetables. These species are mostly found in moist and shady places and available in local market during the monsoon seasons. Many local people even directly collect them from the forest and use them as vegetable. Yuksam-Dzongri forests have a number of dioscoreas, which provide food to people through their yams. Among them, only one species *Dioscorea* sp (Ban Tarul) is available in the private forest of some villages. It is most esteemed among wild yams but difficult to dig. However, pits are dug up to 1.2 m deep to extract the tuber.

In addition to the present research, there has been a number of systematic documentation on enlisting of the wild edible from Sikkim (Sundriyal and Rai 1996; Sundriyal 1999; and their nutrient values (Sundriyal and Sundriyal 2001 a & b).

MEDICINAL PLANTS

About 31 species of widely used medicinal plants were recorded from Yuksam, Tshoka and Dzongri area. *Artemesia vulgaris, Eupatorium adenophorum and Hydrocotyle asiatica* are widely used for different purposes but are not marketed. On the other hand, *Aconitum* sp, *Berginia ligulata, Heracleum nepalense, Litsae citrata, Oroxylum indicum* are openly marketed in the local markets. *Picrorhiza kurrooa, Piper longum, Orchis latifolia, Rubia cordifolia* were even exported to other states through local agents. Most of these species are also use by local practitioner (Bijuwa and Baidya) as herbal medicines. These plants are found in open areas and some in bushy areas of the forests along the altitudinal range of 1600 to 4500 m. At present, they are found in small quantity due to over exploitation in the past.

Gymnadenia orchidis (Panch Amle), a high value medicinal plant of Sikkim

The use of plants as a means to cure certain ailments and disease is an age-old practice throughout the world and the hills are not an exception. From time immemorial the package of herbal medicine has been gradually nurtured and brought up to the present with still more additions. After the exhaustive floristic work on the Sikkim Himalaya was made by Sir J.D Hooker during 1848-50 a few minor works followed. The most comprehensive work had to wait for many years which came in the form of Common Medicinal Plants of Darjeeling and Sikkim Himalaya by Biswas (1956). However, the actively used plants are quite limited in number which are brought to the markets in different quantities

(Sundriyal and Sundriyal 2004; Chettri et al. 2005). Botanical Survey of India, Sikkim Circle houses a large number of herbarium of the medicinal plants. The Council of Science and Technology in Sikkim has initiated creation of database on medicinal plants. The Forest Department of Sikkim under its programme of minor forest produce established 20 trial plots of medicinal plants at different altitudinal zones covering an area of 600 ha (Sharma et al. 1995). Recently Gurung (2002) has brought out a book on the Medicinal Plants of the Sikkim Himalayas. It is a simple handbook dealing with more than 400 species of medicinal plants. The names given in local languages along with the botanical drawings have greatly simplified the identification. In addition to these, a number of researchers have documented the medicinal plants of the state based on the traditional use from the state (Sundriyal and Sharma 1995; Chanda et al.2002; Maity et al. 2004; Hussain and Hore 2007; Pradhan and Badola 2008; Bharati and Sharma 2010).

Rheum acuminatum, a substitute for tea and believed to give relief from body ache- Lampokhari, Sikkim

In the past, before the year 2000, herbal use for a protracted time marked gradual increase in the number of consumers and the reciprocal rise in herbal processing units that have played a major role in diminishing the available medicinal plants in its habitat and also on degradation of ecosystems. In the Sikkim Himalayan context the situation in herbal plant removal from the wild state was already at a detrimental level as described by Biswas (1956) " .. Chirata, Aconite, *Ephedra*, Manjista, Kuth, *Podophyllum*, *Rheum*, *Lycopodium*, Chalmogra, *Ravwolfia* and many others are ruthlessly and crudely collected and sold outside the state." A follow-up in this line (Rai and Sharma 1994) gives account

of spots which were resplendent with jatamasi reported by Gammie in 1894 but hardly a few individuals are encountered now. The case in point is Lachen, a road-head village for collection of herbals from northern Sikkim. A survey at Lachen area in April 1999 reveals a less than 80 kg consignment of kutki and the other two species were of negligible amount (Rai et al. 2000). Department of Forests has totally banned collection of medicinal plants now and export outside the state is almost negligible as per the records.

A project design workshop on cultivation of medicinal plants in Sikkim has identified many valuable medicinal plants for different regions such as (a) alpine region : *Aconitum ferox, Podophyllum hexandrum, Picrorhiza kurrooa, Nardostachys jatamanshi, bergenia* sp.; (b) temperate region : *Swertia chirata, Angelica* sp., *Taxus buccata,* 'Malaigiri' (incense), 'Shunge' (dye), 'Oregana' for foods. *Cinnamomum* sp., *Santhoxylum* sp., *Viola* sp., *Lavenders, Valerian, Hippophae* sp., *Artemesia* sp., and species of veterinary interest; and (c) sub-tropical region : *Terminalia* sp., *Emblica* sp., *Sapindus* sp., *Melia azadirach* ('Neem'), *Solanum khasianum, Asparagus, Rauwolfia serpentina, Dioscorea, Aristolochia* (Sundriyal and Sharma 1995).

Sikkim has a great potential in the development of herbal enterprise that can be linked with conservation and economic development. The agro technologies for many of these high valued medicinal plants are available and they can be given to the communities for cultivation. The value addition and marketing of this important natural resource is of great challenge and opportunity for future development.

Recovering populations of *Bergenia* after conservation interventions by forest department

NATURAL DECORATIVE

Natural forests are source of varieties of attractive natural plants which are used by locals as decorative. Roots of plants, dry flowers, capsules, dry mushrooms, cones of conifers, leaves of fern, fern shoots and seeds of different plant form the decorative of all designs and types. In the study area more than eight types of such decorative are found, which are mostly used for only local purposes. Dried *Anaphalis contorta*, *A. triplinervis* and *Lycopodium clavatum* are widely used as decorative in different occasions whereas *Pollinium mollis* and *Raphidophora* sp are used as decorative in houses. Cones of *Pinus longifolia*, *Abies densa* and *Tsuga dumosa* are also found to be use as decorative in different forms. However, so far, though there is a high potential for these species to be the part of commercial trade for better livelihood for the local people, the sector has been ignored by both researchers and policy makers.

BROOM AND FIBER PLANTS

Broom grass is of great importance in the mountainous region as it provides good quality fodder, fuel, broomsticks and also acts as a soil stabilizer. Recently government had supported its extension through social forestry scheme and the local people are willing to plant this grass as cash crop for broomstick. This grass grow in the sub-tropical Himalayas from plains to 2000 m altitude and are extensively planted in the hills specially in wasteland and also as inter-cropping in agroforestry systems or on the edges of terraces. Some villagers in Yuksam cultivated Amliso (*Thysanolaena maxima*) since last couple of years in some small areas with government incentives. The inflorescence of the broom grass produces the soft broom for cleaning floors. The sticks are used as firewood after drying and the leaves are good fodder. Argeli (*Edgeworthia gardeneri*) and Lokta (*Daphne cannabina*) are widely used by locals for making fibers, papers and also for tying cattle.

Though the boom grass (Shankar et al. 2001) and the fibre plants are important sources of income for the mountain people, these aspect has not been research and the potential has not been documented so far in Sikkim.

CONCLUSION

The rural populations of Sikkim are closely linked to their natural resources. Their economy is largely dependent on NTFPs. Interest in NTFPs is increasing rapidly. Agroforestry innovations in the form of large cardamom and broom-grass cultivation have supplemented the incomes of rural people. Cultivation of medicinal and their use as cash crops are recent. Villagers are well aware of collecting seasons and use of specific products of many NTFP species. Such indigenous knowledge should be tapped and documented. Intensive training on cultivation, conservation, and processing techniques for NTFP, however, needs to be carried out on a large scale. Training needs are felt more in the remote villages. Strengthening of local institutions so that they can provide training is highly recommended, as they are more accessible to the local community.

Active management of NTFP collection and cultivation can help maintain ecosystem complexity and also play an important role in restoring biodiversity. Extraction of a broader range of natural resources other than timber products can lead to economic diversification and stability for rural forest and mountain communities. Setting up national, regional, and global marketing channels for the products will open up avenues for improved access and bring increased benefits to local people. Managing forests by focusing on NTFP will also help increase the long-term value of forest resources and such initiatives could contribute to biodiversity conservation and sustainable forest management of this important biodiversity-rich area.

Appendix. List of NTFPs with their distribution, status market and uses that were recorded from fringe villages of Khangchendzonga Biosphere Reserve (A = abundant, C = common, D = common but declining, R = rare, MR = marketable, NM = non-marketable, NA = data not available)

Species	Vernacular name	Distribution (m)	Marketable/non marketable	Market rate (Rs)	Uses	Status	Availability
Construction and local handicrafts							
Arundinaria hookeriana Munro	Pareng	1200-2100	MR	40 per bundle Tama 10-15 per kg	Mats, house construction, baskets, young shoots as vegetables etc.	D	Whole year
Arundinaria intermedia Munro	Tite nigalo	1200-2100	MR	40 per bundle Tama 10-15 per kg	Mats, baskets, house construction etc.	C	Whole year
Arundinaria malling Gamble	Maling	1850-2750	MR	40 per bundle	Mats, baskets, fencing, walking sticks, flute etc.	C	Whole year
Bambusa nutans Gamble	Mala bans	300-1550	MR	30/individual	House construction, support for prayer flags by Buddhist	D	Whole year
Cephalostachium sp.	Gopey bans	600-2400	NR	30/individual	Fodder, bow and arrow preparation, flutes and straw for drinking local beer.	R	Whole year
Dendrocalamus hamiltonii Nees & Arn. Ex Munro	Choya bans	Upto 1730	MR	30/individual Tama 10-15 per kg	Water pipes, water vessels, young shoots as vegetables, house construction, local handicrafts, fodder for cattle etc.	C	Whole year
Dendrocalamus hookeri Munro	Chilley bans	Upto 1750	MR	30/individual	House construction, fencings, baskets, etc.	C	Whole year
Dendrocalamus sikkimensis Gamble	Bhalu bans	Upto 1800	MR	30/individual	Water vessel, house construction, local handicrafts etc.	R	Whole year
Edible fruits and other product							
Agapetes serpens (White) Sleumer	Bandare khorsane	1500-2600	NM		Flowers are eaten along with the juice in them	A	February-June
Agaricus silvaticus	Kalunge chew	Upto 1300	MR	40 per kg	Used as vegetables.	C	April-September
Allium wallichii Kunth.	Jungli piyaj	2200-4000	NM		Edible and aromatic	R	June-October
Bassia butyracea Roxb.	Chewri	1200-1775	MR	2 per 5 pieces	Fruits ed ible, oil is extracted from thee seeds and used. Leaves are good fodder.	R	June-July
Bauhinia variegata L.	Kiorala	Upto 600	NM		Flowers are eaten as curry, good fodder.	R	March-April
Castanopsis hystrix Miq.	Patle katus	1800-2400	MR	15 per kg	Fruits edible, fuelwood, leaves are good ingredients for composts.	A	Feb-April
Castanopsis tribuloides (Smith) A.DC.	Musre katus	1700-2300	MR	60 per kg	Fruits edible, fuelwood, leaves are good ingredients for composts.	C	Feb-April
Cinnamomum impressinervium Meissn.	Sisi	1220-1830	NR		Seeds edible	A	Whole year

Citrullus colocenthus Schrad.	Indrenni	Upto 1900	MR	5 per piece	Fruits edible	D	Jan-March
Dioscorea bulbifera Br.	Ban tarul	Upto 2000	MR	20 per kg	Used as food.	C	Jan-Feb
Diplazium sp.	Sauney ningro	Upto 2000	MR	5 per bundle	Used as vegetables.	C	May-July
Elaeocarpus lanceafolius Roxb.	Bhadrase	1830-2450	MR	18 per kg	Fruits edible	D	April-June
Evodia fraxinifolia Hk.f.	Khanakpa	1200-2100	NM		Fruits used as pickles and as medicine for dysentery	C	Aug-Sep
Ficus infectoria L.	Kabra	Upto 1700	NM		Shoots are edible, good fodder.	C	Feb-March
Myrica gale L.	Kaphal	Upto 1725	MR	NA	Fruits edible, gums and resins are extracted for local use.	R	July-Sep
Girardinia palmate Gand.	Bhangre sisnu	1000-2500	MR	5 per bundle	Young leaves and shoots use as substitute for dal which are good for blood pressure patients.	A	July-Sep
Gaultheria trichophyla Royle		2700-4500	NM		Fruits are eaten by children	A	May-July
Pentapanax leschenaultii Seem.	Chinde	1750-3000	MR	10 per kg	Young shots edible, used as fodder.	D	March-April
Juglans regia L.	Okhar	1000-2000	MR	2 per piece	Fruit edible, bark-anthelminthic and detergent, leaves- astringent and tonic, oil of kernel cures skin diseases etc.	D	April-Sep
Urtica dioica L.	Patle sisnu	Upto 2700	MR	8 per bundle	Young leaves and shoots use as substitute for dal which are good for blood pressure patients.	A	May-Aug
Machilus edulis King.	Lapche kawla	1220-2400	MR	1 per piece	Fruits edible, leaves are good fodder.	C	Nov-Dec
Machilus odoratissima (Nees) Kosterm	Lalikaulo	1500-2150	NM		Fruits edible, leaves are good fodder.	C	Nov-Dec
Mahonia sikkimensis Takeda.	Chutro	1300-2700	NM		Berries edible	A	July-Aug
Pleurotus sp.	Chamrey	NA	NM		Used as vegetables.	C	NA
Pleurotus sp.	Kanney chew	1500-2450	MR	50 per kg	Used as vegetables.	C	Julu-Aug
Prunus nepaulensis (Seringe) Steud.	Arupate	1800-above	NM		Fruits edible, fairly good fodder and fuelwood.	C	March-Aug
Pyrularia edulis A DC.	Amphi	600-1800	MR	NA	Fruits edible, poss es wax in kernel and were use this wax for lighting.	D	NA
Pyrus pashia Buch.-Ham. Ex D. Don	Mehel	800-2400	MR	10 per kg	Fruit extracts used for curing blood dysentery	D	Nov-Dec
Quercus sp.	Phalant	1850-2700	NM		Acorns are good food for beer, fuelwood etc.	A	March-May
Quercus sp.	Sungure katus	1830-3000	NM		Nuts edible, bark and acorns used as astringent	D	March-May
Rhus semialata Murr.	Bhakimlo	900-1850	MR	NA	Seeds use as medicine dysentery	A	July-Aug

Rubus ellipticus Smith.	Aselu	1000-2200	MR	40 per kg	Fruits edible	A	March-May
Rubus hypargyrus Edgew.	Kalo aselu		MR	40 per kg	Fruits edible	C	March-May
Spondias axillaries Roxb.	Lapsi	300-1400	MR	20 per kg	Fruits edible, pickles are also prepared.	D	May-Oct
Symplocos theifolia D.Don	Kharanay	1800-3000	NM		In the past, people use to extract oil from the seeds for cooking.	A	July-Aug
Tupistra nutans Wall.	Nakima	1800-3000	MR	60 per kg	Flower are taken as curry	D	Sep-Oct
Utica dioica L.	Gharia sisnu	1000-2500	MR	5 per bundle	Dried plants are use to prepare paste and applied on minor fractures. Leaves and shoots use as substitute for dal.	A	April-July
	Kali ningro	Above 1750	NM		Used dysentery.	C	May-Sep
	Jhari chew	1800-2000	NM		Used as vegetables.	C	May-Sep
	Hieun chew	Above 2500	NM		Used as vegetables.	C	May-Sep
	Katuse chew	Upto 1800	NM		Used as vegetables.	C	May-Sep
	Kalamen uneu	1650-2450	NM		Used as vegetables.	C	May-Sep
Medicinal							
Abies densa Griffith ex R. Parker	Gobrey salla	2550-3700	NM		Leaf extracts use in repeated doses for asthma, bronchitis and stomach trouble.	A	Whole year
Aconitum ferox Wall.	Bikhuma	2100-4000	MR	1350/kg	High medicinal value, use in diaphoretic, diuretic, expectorant, febrifuge, diabetes,	D	July-Sep
Acorus calamus Linn.	Bonjho	1000-2000	MR	NA	Paste prepared from rhizome used in skin diseases, powder taken orally for cough, malaria and asthma	D	Whole year
Artemisia vulgaris Linn.	Titepate	800-2000	NM		Use in different medication as deobstruent, antispasmodic, obstructed menses and hysteria.	A	Whole year
Astilbe rivularis Ham.	Buro okhati	1200-2100	MR	NA	Rhizomes chewed as areca nut and used as pain relief.	D	July-Aug
Bergenia ciliata (Haw.) Stenb.	Pakhan bet	Upto 3000	MR	75 per kg	Roots use in analgesic, tridosha, piles, heart diseases, spleen enlargement and many other diseases.	D	Whole year
Bergenia purpurascens (Hook. F. & Thoms.) Engl.	Khokim	3400-4200	NM		Dried roots use in as substitute for tea and believe to give relief from body ache.		
Clematis buchananiana DC.	Pinasay lahara	1800-2800	NM		Fresh roots are mashed and the effluvium is drawn through nose to cure sinusitis and nose - blocks.	D	Whole year
Dichroa febrifuga Lour.	Basak	900-2400	NM		Dried leaves orally taken in fever	C	July-Aug
Drymaria cordata Wild.	Abijalo	1000-2000	NM		Used in nose dysentery.	C	Whole year

Eupatorium canabinum Linn.	Banmara, kalijhar	1000-2000	NM		Crushed juice from leaves are applied in cuts and bleeding spots immediately	A	Whole year
Heracleum nepalense D.Don	Chimphing	1550-3600	MR	3 per packet	Fruits are used as pickles, used as anti -typhoid, nausea and vomiting	D	Aug-Oct
Hydrocotyle asiatica Linn.	Golpatta	1300-2000	NM		Fresh leaves are crushed and administered orally to relieve blood pressure and throat pain.	C	Whole year
Holboellia latifolia Wallich.		2400-3200	NM	NA	Fruits edible, stem used to make bangles, which are believe to give relief from orthopedic problems.	R	Whole year
Kaempfera rotunda Linn.	Bhuin champa	1300-2000	MR	NA	Tubers used as poultice in fracture, healing fresh woods and removes coagulated bloods from the body.	R	NA
Litsae citrata Bl	Siltimur	Upto-2700	MR	NA	Dried fruits are used as medicine for nausea and giddiness, fresh fruits used as pickles.	D	Aug-Sep
Dactylorhiza hatagirea (D.Don) Soo	Panch aunle	3000-4000	MR	80/kg	Paste made out of the tubers is applied over cuts and bruises. It is also used orally for body ache	R	Aug-Sep
Oroxylum indicum Vent.	Totala	Upto 1000	MR	10 per garland	Flower edible, root bark improves appetite, use in vomiting, asthma, bronchitis etc.	R	Aug-Dec
Picrorhiza kurrooa Royle ex Benth.	Kutki	3000-5000	MR	210/kg	Dried roots are used orally in malarial fever. It is also used as cathartic, purgative and dyspepsia.	D	Whole year
Piper longum Linn.	Pipla	Upto 1700	MR	60 per kg	Roots use in a nthelminthic, improves appetite, abdominal pain. Fruits use for anti -diarrhoeatic, anti -dysenteric, piles, leprosy etc.	C	Whole year
Plantago sp.	Isabgol	Upto 1750	NM		Plant use as medicine for rheumatism, roots as astringent and fever, and seed in dysentery.	C	Whole year
Polygala arillata Buch.-Ham ex D.Don	Marcha	600-1800	MR	NA	Roots use for preparation of yeasts.	D	NA
Rheum australe D.Don	Padamchal	3600-4500	MR		Dried roots use as tea.	D	July-Sep
Rheum nobile Hook.f.& Thoms.	Kenjo	3600-4500	NM	60/kg	Whole plant is eaten, used as pickles, have medicinal value.	R	July-Sep
Rhododendron arboreum Smith	Lali guras	1500-3300	NM		Dried flowers use for curing dysentery	A	Jan-March
Rubia manjith Roxb. Ex Fleming	Majhito	1000-2000	MR	650 per ton	Color extracts are used in dying. Roots have medicinal value.	C	Whole year
Rumex nepalensis Sprengel	Halhalay	1800-3000	NM		Dried root is use in preparation of paste and taken orally in hepatistis. It is also applied during loss of hairs.	A	Whole year

Solanum sp.	Jungli bihin	Upto 1800	NM		Root use in bronchitis, asthma, fever, pains. Piles etc. Fruits increase appetite and good for heart diseases and fever. Fruits are burnt and use its smoke for relief from toothache.	C	Whole year
Swertia chirata Ham.	Chirato	1225-3000	MR	20-30/kg	Medicinal use for anthelmintic, antipyretic, antiperiodic, laxative, leucoderma, inflammation, ulcer, asthma piles etc.	D	May-Oct
Viscum articulatum Burn.f.	Harchur	300-2000	MR	80 per kg	Dried plants are use to prepare paste and a pplied on minor fractures.	R	Whole year
Zanthoxylum acanthopodium DC.	Boke timur	Upto-2250	MR	40 per kg	Medicine for ear diseases, headache, leucoderma, asthma and good appetizer	D	May-Sep
Natural decorative							
Abies densa Griffith ex R. Parker	Gobre salla	2800-4000	NM		Cones are used as decorative		April-May
Anaphalis sp.	Bukiphul	1700-2750	NM		Dried flowers are decorative and also used for preparation of pillow	A	July-Sep
Anaphalis sp.	Bukiphul	1850-2750	NM		Dried flowers are decorative and also us ed for preparation of pillow.	A	July-Sep
Pinus longifolia Roxb.	Salla	500-2000	NM		Cones are used as decorative		Feb-April
Lycopodeum sp.	Nagbelli	1850-2750	NM		Entire plant is decorative and pollen is used as gunpowder.	C	Whole year
Pollinia mollis (Griseb.) Hack.	Memkesh	1550-2450	NM		Flowers spikes are decorative	R	Whole year
Raphidophora sp.	Kanchirna	Upto-2000	NM		Planted as decorative, leaves good fodder, stems used as feed for pig and cattle.	A	Whole year
Tsuga dumosa (D Don) Eichler		2100-3500	NM		Cones are used as decorative		May-June
Fiber, broom and incense species							
Daphne cannabina var. bholua (Buch.-Ham. ex D. Don) Keissl.	Kagatay	1850-3000	MR	NA	Bark is used as ropes but also have potential for preparation of paper.	C	Whole year
Edgeworthia gardneri (Wall.) Meisner	Argeli	Upto 1850	MR	NA	Bark is used for preparation of paper, making ropes and even tying cattle.	C	Whole year
Thysanolaena maxima Kuntze.	Amliso	Upto-2000	MR	Broom 1000 per ton.	Broom are prepared from the inflorescence,, fodder, soil binder and fuelwood after drying the sticks.	A	Whole year
Juniperus recurva Buch-Ham. ex D. Don	Bhairun patay	3600 above	MR	NA	Local Buddhist uses leaves as incense.	C	Whole year
Rhododendron setosum D. Don.	Sunpatay	3600 above	MR	NA	Local Buddhist uses leaves as incense.	C	Whole year

Source: Chettri 2000.

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