

## Non-Timber Forest Products (NTFP's) in Low lands of Kanchanpur District of Nepal: Indigenous use and Conservation

Nabin Raj Joshi<sup>1</sup>, Laxman Singh Lodhiyal<sup>1</sup> and Vishal Singh<sup>2</sup>

<sup>1</sup>Department of Forestry and Environmental Science, Kumaun University, Nainital-263002, India.

<sup>2</sup>Centre for Ecology Development and Research, 41/I, Vasant Vihar, Dehradun 248006

Email: [nabin2001@gmail.com](mailto:nabin2001@gmail.com)

**Abstract:** The present study intended to highlight the status and potential of non-timber forest products (NTFPs) in community forests and the national forest of Kanchanpur district in far western region of Nepal. The human ecological approach, participatory rural appraisal, focus group discussions and interviews were used to gather the data and information for analysis. The results of the data analysis indicate that the study area harbors a high diversity of potential NTFPs. Altogether, 123 species belonging to 62 families and their traditional uses were recorded. 20 NTFP species were awarded highest priority out of a total 123 NTFP's as documented by this study named them priority species. Despite an enduring socio-cultural transformation of the local communities, they still possess sufficient knowledge of plants and their uses. It is observed that the proper management of the NTFPs could play a critical role in the improvement of people's livelihood in a sustainable way.

[Nabin Raj Joshi, Laxman Singh Lodhiyal and Vishal Singh. **Non-Timber Forest Products (NTFP's) in Low lands of Kanchanpur District of Nepal: Indigenous use and Conservation.** World Rural Observations 2010;2(4):43-55]; ISSN: 1944-6543 (Print); ISSN: 1944-6551 (Online). <http://www.sciencepub.net/rural>.

**Keywords:** participatory, community, potential, livelihood, sustainable

### 1. Introduction

Non-timber Forest Products (NTFPs) are important tools for addressing poverty issues for the marginalized, forest dependant communities, by contributing to livelihoods, including food security, income, health and sustainable human development (FAO 1995; Falconer 1997; Ahenkan and Boon 2008). Globally, an estimated 350 million people mostly in developing countries depend on NTFPs as their primary source of income, food, nutrition, and medicine (Chandrasekharan 1996; Olsen 1998; UNDP 2004; FAO 2005). These products play a vital role in sustaining the lives of local gatherers, who must increasingly adapt to diminishing resources to stay alive.

In Nepal, hundreds of plant species are used as NTFPs (Rawal 1997; Shrestha et al. 2004) and have great conservation and economic value (Gauli and Hauser 2009). These resources are a key source of income and livelihood for many poor people in Nepal. In certain areas, NTFPs provide up to 50 percent of the total household income (Edwards 1996). The uses of NTFPs vary from place to place because of the heterogeneity of the community and different traditional practices by ethnic groups in the country. In recognizing this economic value, forest policies of Nepal have recommended sustainable NTFP management for poverty reduction and livelihood improvement by ensuring community participation in forest management (GoN 2004).

The significance of NTFPs in rural livelihood improvement and for subsistence has been established

by a number of studies at the national level in Nepal (Kanel 1999; Shrestha et al. 2003; Gauli and Hauser 2009), but little is known about their collection and marketing dynamics (Bista and Edward 2006). Tracing the history of NTFP exploitation reveals an over-harvesting of medicinal plants; other items are largely being ignored. The potential uses of many of the NTFPs have not being well-documented in Kanchanpur district despite their potential in poverty reduction and livelihood improvement amongst the indigenous people. The documentation of other uses of NTFPs is essential in the sense that it will provide choices and help the communities to improve their economic conditions by exploring more market values and potentialities. Thus, the specific purpose of this paper is to document the available NTFPs used by indigenous people in Kanchanpur district of Nepal, their status and contribution towards improving the livelihoods of the local people as well as identification and prioritization of NTFP species for sustainable management and identify key management challenges. The study was guided by the assumption that the area harbors a high diversity of economic plants but the population is less aware about the potentials of these resources which can significantly contribute towards sustainable livelihood improvement and poverty reduction. The conceptual framework on which this paper is anchored is the role of NTFPs in improving the livelihoods of the poor in forest fringe communities and sustainable forest management. The principal premise of the paper is that NTFPs play an important role in meeting the needs of rural communities, especially in the areas of food,

medicine, and poverty reduction, sustainable management of forest resources and livelihoods improvement (FAO 1995; Marshall et al. 2005). Besides medicinal plants the use of diverse groups of NTFPs is largely ignored by the Nepalese community and development organizations. It is therefore high time to explore and promote other NTFPs by not excluding medicinal plants. Sustainable collection, use and commercialization are the main drivers in the promotion of NTFPs for community development, poverty reduction and livelihood improvement and sustainable forest management.

## 2. Materials & Methods

### 2.1 Study site

The study site was located on foot hills of Kanchanpur district in Nepal. The three sites undertaken in the study extends over 161741 hectares. The latitude and longitude of study area ranges from 28°32'to 29°08'N and 80°03'to 80°33'E respectively, between an altitude of 160m and 1528m from above mean sea level. Extensive field surveys were carried out in the Kanchanpur district for about 6-months.

### 2.2 Data collection and analysis

The study was carried out during September-February, 2008. Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA) following Martin (1995) were conducted on the use of wild plants with focus on the season of availability, mode of harvest, status of the plant, personal and community choices, commercial values, and indigenous conservation approaches. Guidelines for the interviews and group discussions were developed to facilitate the collection of information. Altogether six community-level discussion groups were held in different localities representing an average of eight persons in each discussion group. Additional 21 key informants like plant collectors, cultivators, traditional healers, traders, community heads and district forest office staffs were purposively selected for interviews. Prior informed consent was obtained with the help of community workers that facilitated interviews and discussions with the local people. Livelihood assessment was done by investigating the people's engagement in activities like collection, harvesting, processing and packaging of NTFPs in the area, and their overall contribution to the local and national economy. Accordingly, a score was assigned by different species on the basis of socio-economic value (Table 1). The local and regional market survey was conducted to know the potential species in trade and their price. The abundance of the species was determined based on resource mapping with the community and forest study. Key informants were also requested to walk along the botanical inventory transects and to report different vegetation

types and useful species. These walks also provided an opportunity to valorize the findings of RRA and PRA, and allowed to gather information about the local names of many species. Herbarium specimens were collected for each species and brought back to the lab to facilitate identification using reference collections and expert knowledge.

## 3. Result

### 3.1 Indigenous use of NTFP's in Kanchanpur district

Altogether, 123 species under 62 families and were identified as NTFPs, which were commonly used plants by the local people for domestic purposes (Table 3). Well represented families are Leguminosae (12 species), Gramineae (12), Moraceae (12), Euphorbaceae (8), Liliaceae (6), Aracaceae (4), Cucurbataceae (4), and Solanaceae (4). Angiosperms were distributed into different seven life forms, with trees and herbs having the most species (Fig. 1). Plants were used mainly for Medicine, fruit, vegetables, fermentation material, fiber and thatching. For the different categories, medicinal plants comprised the highest number of 55 species (45%); followed by fodder 22 (18%); fruits 11(9%); fermentation 10 (8%); Vegetables 8 (7%); fodder (7); Ornamental 5 (4%); Agricultural implements 3 (2%); Rope making 5 (4%); plants having Religious importance 3 (2%); and Thatching 1(1%) (Fig.2). People in this area were largely marginalized and landless. Dependency on forest was therefore quite high. Seasonal vegetable species such as *Rumex hepcolnsis* (Halhale sag), *Chenopodium album* (Bethe sag), *Atocarpus heterophyllus* (Rukh Katahar), species of Mushroom, *Bauhinia variegata* (Koiralo) and *Dioscorea bulbifera* (Tarul) were regularly consumed and preferred by the local people. Similarly, *Syzygium cumini* (Jamun), *Ficus racemosa* (Gullar), *Aegle marmelos* (Bel), *Schleichera oleosa* (Kusum), *Phyllanthus emblica* (Amala), *Zizyphus mauritiana* (Bayar), were seasonal fruits consumed locally. The native Tharu inhabitants of the study area are using several species of medicinal plants such as *Piper longum* (Pipla), *Acorus calamus* (Bojho), *Terminalia chebula* (Harro), *Terminalia bellirica* (Barro), *Emblica officinalis* (Aamala) *Aegle marmelos* (Bel), *Cassia siamea* (Sikakai), *Holarrhena pubescens* (Dudhe), *Tinospora sinensis* (Gurjo), and many more in traditional healing practices.

### 3.2 Trade, priority status and traditional uses

Even though many seasonal vegetables, fruits, medicinal plants and Bamboo spp. have a good market value, income through commercialization of such species was very low due to inadequate market information, the local communities were unaware

about the possibility of selling their forest products. Nevertheless, some of the species such as dried *Terminalia bellirica* (Barro) dried *Piper longum* (Pipla), fruit of *Ricinus communis* (Renu), pod of *Bauhinia vahlii* (Bhorla) and *Phyllanthus emblica* (Amala), *Zingiber officinale* (Aduwa) were sold in the local market in small scale. The regional market study showed that there were many species like *Asparagus racemosus* (Kurilo), *Aegle marmelos* (Bel), *Syzygium cumini* (Jamun), *Emblca officinalis* (Aamala), *Acorus calamus* (Bojho), *Apis nepalensis* (Honey), *Culapiopsia binata* (Babiyo) that have high market demand and also are available in huge stock in the forest. The forest comprised considerable number of NTFPs collected and exported from the district such as *Bauhinia vahlii* (Bhorla), *Acacia rugata* (Sikakai), *Eulaliopsis binata* (Babiyo), and *Asparagus racemosus* (Kurilo). Among these products, *Asparagus racemosus* (Kurilo), *Acorus calamus* (Bojho), *Bambusa vulgaris* (Bamboo), *Ziziphus mauritiana* (Bayar) was the major income generating NTFP that contributed to the cash income of the local people. In general, the divers groups of NTFPs were used mainly for local subsistence and less used for trade, income generation and livelihood improvement.

By employing certain criteria such as species abundance in the surrounding forest, existing indigenous knowledge systems, economic importance, market value and local people's interest including the perspectives and suggestions of management authorities 20 species were recorded to be of high priority (Table. 2) for immediate promotion for income generation through collection and commercialization as they possess high market demand and price as well as high abundance in the surrounding forests. The 20 priority species includes *Asparagus racemosus*, *Acorus calamus*, *Raulvolfia serpentine*, *Piper longum*, *Emblca officinalis*, *Terminallia belerica*, *Aegle marmelos*, *Withenia somnifera*, *Bambusa vulgaris*, *Acacia catechu*, *Cymbopogaon lexusas*, *Zingiber officiale*, *Cordia vestita*, *Lactiporus sulphureus*, *Atrocarpus heterophyllaus*, *Cassia siamea*, *Azadirchta indica*, *Permellia nepalensis*, *Pterocarpus marsipium*, *Tinospora sinensis* However, these species required careful management and treatment. Species included in the priority group are those plants which are very useful and valuable for trade because they command a high price but are not collected and traded in large scale as they are not in large quantities. These plants therefore need to be conserved. Also species of this group are commonly available and traded, but not in Nepal. For example, *Murraya koenigii* (Currypatta), is highly demanded spice in South India but unknown about its quality and quantity. These plants need some treatment before they are marketed.

### 3.3 NTFP's Conservation Management and Challenges

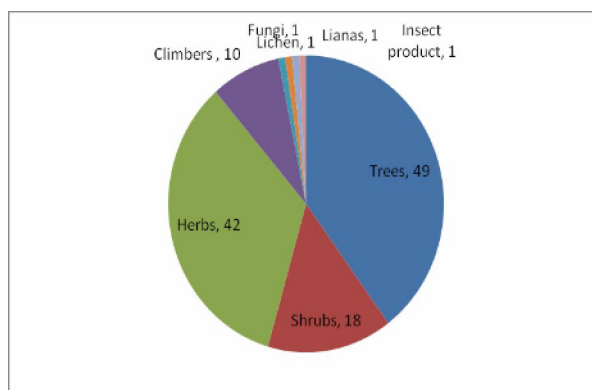
The communities in Kanchanpur district have utilized and traded several NTFPs in different ways but without paying adequate attention to their conservation. The species which are propagated by means of root, rhizomes and seeds need careful attention during harvesting. For example, hazardous collection of the root, wood and rhizome of species such as Bojho, Kurilo, and Tarul might have severe conservation threats because the propagation of these species generally happens via the underground parts. Likewise, the inappropriate harvesting of the bark of Bhorla is another sustainability threat. The over-harvesting of fruits, leaves, wood for pot making and seeds of Amala, Barro, Harro, Vijayasal, Zamun, Sikakai and Kusum also lead to their depletion and are in the verge of extinction. There was unfair/unhealthy competition for the collection of products. Bhojo, Kurilo and some exotic species like *Mentha arvensis* and *Cymbopogon flexuosus* were under cultivation in the study site. With regard to the conservation practices, some of the community forests have established nurseries for the production of seedlings of medicinal plants. The majorities of the forest patches were under the community forests and managed by the local community forestry user groups (CFUGs). But there were limited conservation and sustainable management activities conducted for NTFPs. Normally, CFUGs need to incorporate NTFPs in management plan but due to technical problems of proper identification they could not include the NTFPs properly in their management plan.

Many of the local people were found interested to get involved in collection and sale of NTFPs in the study area. However, there were several challenges that were limiting their interests. The main challenges that came across through our study were mainly, lack of NTFPs processing facilities in local level, market information, lack of infrastructure for storage, value addition and grading of products, and lack of clear policy on collection, trade permits and taxation.

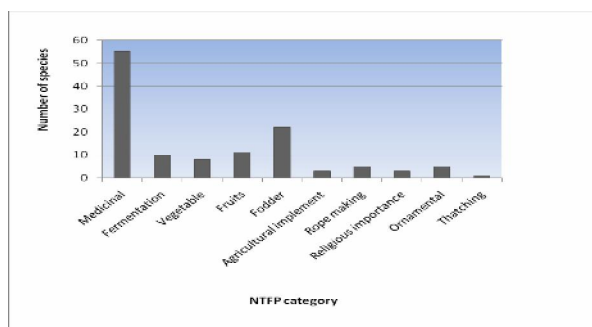
### 4. Discussion

Plants have always been central part of the life and culture of the Nepalese people (Manandhar 2002), and all aspects of the Nepalese folk-life and beliefs are related to the vegetation in vicinity (Shrestha et al. 2004; Uprety et al. 2008). The relationship between local people and NTFPs in the present study shows the wealth of indigenous knowledge on the different aspects of plant utilization in the district. Indigenous knowledge plays an important role in the extraction of NTFPs (Narendran et al. 2001). In present study the local people were found less aware about the market value of many species and therefore not able to

generate significant income from NTFPs though they offer huge opportunities. Therefore, the identification and prioritization of the species were carried out for the management and commercial purpose. It is therefore important to develop sound and sustainable strategies to mainstream NTFPs into the modern economy, while guaranteeing their accessibility to local communities. As the development of NTFPs increases, there is a danger of unsustainable exploitation; increasing demand can lead people to disregard traditional sustainable harvesting techniques. The management of NTFPs, especially their income and employment generation functions, must not ignore the local indigenous knowledge, the ecological impacts of NTFPs extraction, the development of appropriate small-scale enterprises and cooperatives for collecting, processing, marketing, monitoring, and sharing of rights and benefits. The roots and seeds which are the propagating materials are being over harvested. The removal of roots can have significant detrimental effects on plant survival and regeneration (Dhillon and Amundsen 2000; Ghimire et al. 2005). Some of the medicinal plants are cultivated in the community forests. Such practice offers the most effective solution for conservation of many species (Schippmann et al. 2002) and also produce significant amount of products that can be supplied to the market.



**Figure 1. Growth Forms of Plant Species**



**Figure 2. Categories of NTFPs in Kanchanpur District**

**Table 1. Status of score obtained by different species on the basis of socio-economic value**

S.N.	Common Name	Botanical name	Rank obtained in different focus group discussion							Total score
			A	B	C	D	E	F	G	
1	Amala	<i>Emblica officinalis</i>	20	10	15	16	12	10	20	103
2	Harro/Harrar	<i>Terminallia chebula</i>	20	-	20	20	-	20	20	100
3	Barro/Barrar	<i>Terminelia belerica</i>	-	-	-	-	3	-	-	3
4	Kurilo	<i>Asparagus racemosus</i>	20	20	18	20	17	20	20	135
5	Pipla	<i>Piper longum</i>	20	16	10	15	16	18	20	115
6	Gurjo bela/ Lahera	<i>Tinospara sinensis</i>	10	-	8	-	-	-	8	26
7	Vijayasal	<i>Pterocapus marsipium</i>	10	10	16	10	-	-	16	62
8	Amaltash	<i>Cassia fistula</i>	-	-	-	-	10	-	5	15
9	Sal	<i>Shorea robusta</i>	-	-	-	-	-	10	-	10
10	Muhroom	<i>Lactiporus sulphureus</i>	20	-	20	-	-	-	15	55
11	Bel	<i>Aegle marmelos</i>	14	-	10	18	16	20	16	94
12	Jamun	<i>Syzizyum cumini</i>	-	-	-	-	4	-	-	4
13	Kushum	<i>Scheleria oleosa</i>	-	-	-	7	-	-	-	7
14	Malu	<i>Bahunia vehlii</i>	-	-	-	-	-	-	-	13
15	Babiyo	<i>Eulalips binnata</i>	7	6	-	-	5	-	-	18

S.N.	Common Name	Botanical name	Rank obtained in different focus group discussion							
			A	B	C	D	E	F	G	Total score
16	Amriso	Thysanalaena maxima	7	4	-	-	-	4	-	15
17	Aaduwa	Zingiber officinale	10	-	10	11	10	10	12	63
18	Rudilo	Pogostemom bengalensis	-	-	-	1	-	-	-	1
19	Bojho	Acorus calamus	20	20	20	10	2	20	20	122
20	Sarphagandha	Raulvofia serpentine	20	20	10	18	16	20	16	120
21	Neem	Azadirchta indica	20	-	-	10	-	12	-	42
22	Jhayu/Lichens	Permellia nepalensis	20	-	-	-	20	-	-	40
23	Ghuikumari	Aloe barbadensis	2	-	-	5	-	3	7	17
24	Chattivan	Alstonia scholaris	-	-	-	-	-	-	10	10
25	Semal	Bombex ceiba	10	-	-	-	-	-	5	15
26	Aakashibeli	Cuscuta reflexa	15	-	-	-	-	-	-	15
27	Khair	Acacia catechu	10	18	-	15	-	20	-	68
28	Sindurae	Melortus phillipinesis	-	-	-	-	-	-	-	3
29	Tulsi	Ocimum scantum	-	-	-	-	-	-	12	12
30	Kagati	Citrus reticulate	8	-	-	-	7	-	-	15
31	Kalo haledo	Curcuma longa	-	16	-	-	-	1	-	17
32	Koiral	Baunna verigata	-	-	15	-	-	-	-	15
33	Citronella	Cymbopogon witerianus	-	-	-	-	11	-	-	11
34	Bamboo/Bans	Bambusa vulgaris	13	-	18	15	14	16	-	76
35	Leamon grass	Crymbopogaon lexusas	15	10	12	-	8	12	10	67
36	Ashwagandha	Withania somnifera	10	5	15	10	16	10	16	82
37	Jatropha/Khiro	Jatropha coracus	-	-	-	-	-	-	8	8
38	Mango	Mengifera indica	5	-	2	-	8	1	2	18
39	Maha/Honey	Apies nepalensis	-	-	16	-	-	-	-	16
40	Rukh kathar	Atrocarpus heterophyllaus	-	20	-	8	10	-	10	48
41	Rambas	Agave americana	-	-	-	10	-	-	-	10
42	Kera/Banana	Musa nepalinsis	10	-	-	-	5	-	-	15
43	Kanthakari	Solanum virgrinum	16	-	-	-	-	-	-	16
44	Ritha	Spandius mokurossa	-	-	-	13	-	-	-	13
45	Bayar	Ziziphus mauritiana	-	-	-	15	-	-	-	15
46	Sikakai	Cassia siamea	10	-	6	-	12	10	8	46
47	Bhorla	Cordia vestita	20	-	20	-	20	-	-	60

**NOTE:**

The symbol A, B, C, D, E, F, and G represents the following

A= Baijnath community forestry user group, Barakunda-1 Kanchanpur .

B= Sahid –Smriti CFUG, Tilakpur-3 Kanchanpur.

C=Siddha CFUG, Haldukhal-7 Kanchanur.

D=Gawalawari CFUG, Bani-6, Kanchanpur.

E=Village level traders.

F=NTPPs knowledgeable teachers.

G=Healers.

**Table 2. list of species according to the priority**

S.N.	Local Name	Scientific Name	Total Rank out of 150	Type of Product
1	Kurilo	<i>Asparagus racemosus</i>	135	Tuber
2	Bojho	<i>Acorus calamus</i>	122	Rhizome
3	Sarphagandha	<i>Raulvolfia serpentine</i>	120	Roots
4	Pipla	<i>Piper longum</i>	115	Dry fruit
5	Amala	<i>Emblica officinalis</i>	103	Fruit pulp
6	Barro	<i>Terminallia belerica</i>	100	Fruit pulp
7	Bel	<i>Aegle marmelos</i>	94	Fruit pulp
8	Ashwagandha	<i>Withenia somnifera</i>	82	Root and Fruits
9	Bamboo/Bans	<i>Bambusa vulgaris</i>	76	Whole plant
10	Khair	<i>Acacia catechu</i>	68	Kattha
11	Leamon grass	<i>Crymbopogaon lexusas</i>	67	Whole plant
12	Aaduwa	<i>Zingiber officinale</i>	63	Rhizome
13	Bhorla	<i>Cordia vestita</i>	60	Bark
14	Chayu	<i>Lactiporus sulphureus</i>	55	Dry plant
15	Rukh kathar	<i>Atrocarpus heterophyllaus</i>	48	Fruit
16	Sikakai	<i>Cassia siamea</i>	46	Whole plant
17	Neem	<i>Azadirchta indica</i>	42	Leaf Bark and fruit
18	Jhayu	<i>Permellia nepalensis</i>	40	Whole plant
19	Vijayasal	<i>Pterocarpus marsipium</i>	63	Gum and fruit
20	Gurjo bela	<i>Tinospara sinensis</i>	26	Stem and Rhizome

**Table 3: List of NTFP's found in Kanchanpur District, Nepal**

S.NO	Local name	Latin name	Family	Life form	Parts used	Local use value
1	Ratigedi	<i>Abrus precatorus</i>	Leguminaceae	C	Leaf, seed, root	Leaf juice are used to treat sour, seed paste used in sciatica, stiff, shoulder leucoderma and also used in purgative.
2	Babool	<i>Acacia arbica</i>	Leguminaceae	T	Leaf, Bark	Very good fodder, Bark juice/paste is used to make fermenting material "Marcha".
3	Khair	<i>Acacia catechu</i>	Leguminaceae	T	Bark, wood	Bark juice used in Aau (dysentery) and timber for making handles of agricultural utensils.
4	Bojho	<i>Acorus calamus</i>	Araceae	H	Root	Anti-helminthes, used in cough and fever.
5	Haldu	<i>Adina cardifolia</i>	Rubinaceae	T	Leaf	Used as fodder.
6	Bel	<i>Aegle marmelos</i>	Rutaceae	T	Fruit, leaf, whole plant	Used in constipation and juice making, dysentery and leaves have religious value Fruit edible, fruit juice used as fish poison Entire plant has ritual importance.
7	Ketuki	<i>Agave Americana</i>	Agavaceae	H	Whole plant	Used in rope making, soil conservation and live fencing.
8	Payaj	<i>Allium ceipa</i>	Liliaceae	H	Tuber	Vegetable spices, and juice used as sedative and ear pain.
9	Lashusn Ban	<i>Allium malichii</i>	Liliaceae	H	Tuber	Spices, stomach ache and bleeding.

10	Jambu	Allium strachegi	Amarylidaceae	H	Whole plant	Its sap is used for body massage and bulb is used is pectoral disease, piles and also used as spice.
11	Ghyu Kumari	Aloe barbadensis	Liliaceae	H	Juice of leaf	Used in constipation, burn and facial.
12	Sitaphal	Annona squmosa	Moraceae	S	Fruit, seeds	Edible, seed used for oil extraction.
13	Maha	Apis nepalensis	Apidae	I	Honey	Medicinal and Tonic.
14	Supari	Areca catehu	Araceae	S	Fruit, Nuts	Edible.
15	Kurjo	Artemisia annua	Asteraceae	H	Leaf, branches	The extract of herb is effective in curing malaria, sap is used in fever.
16	Kurilo	Asparagus racemosus	Liliaceae	H	Root/Tuber	Roots are anti-diarrheic and diuretic which are used in fever also used as Tonic, Gastritis and milk production for livestock.
17	Kathar	Atrocarpus heterophyllaus	Moraceae	T	Fruit	Vegetable.
18	Neem	Azadirchta indica	Meliaceae	T	Bark, leaf, fruit, seed	Used in typhoid, wound insecticide, Juice used as refrigerant.
19	Kat Bans	Bambusa arundinaceae	Gramineae	T	Whole plant	Basket making, Leaf juice used in jaundice, young root shoots as good vegetable; root juice is used in Otitis (Kan Pakne).
20	Tanki	Bauhnia purpurea	Leguminaceae	T	Bark, flower	Antidiarrhetic and anti-dysenteric also used as good fodder.
21	Malu	Bauhnia velhi	Leguminaceae	C	Leaf and bark	Leaf used as a plate (Doona) making and rope making.
22	Koiral	Bauhnia verigata	Leguminaceae	T	Leaf and Flower	Leaf used as Fodder and flower used as vegetable, pickle making as well as medicine.
23	Kubindo	Benincasa hispida	Cucurbitaceae	C	Fruit	Used in jaundice, vegetable and sweet making.
24	Khaserato	Boehmeria temifolia	Urticiceae	S	Root	Used in retained placenta for livestock.
25	Semal	Bombex Ceiba	Bombacaceae	T	Flower	Flowers are used in pillow making; Flowers are taken as vegetable and Calyx used in boils.
26	Ank	Calostropis gigantean	Asclepiadaceae	S	Root, leaf	Dysentery, cough, Asthma and wounds.
27	Bhang	Canabis stava	Cabanaceae	S	Bark, leaf, seed	Bark used as thread making, clothaned and seed used in pickle making.
28	Lal mirch	Capsicum frutescens	Solanaceae	H	Fruit	Vegetable and Making chilly sauces.
29	Papaya	Carica papaya	Caricaceae	T	Fruit	Edible, used in jaundice.
30	Rajbrikaha	Cassia fistula	Leguminaceae	T	Fruit,leaf	Used in dysentery, and leaf pest is used for curing allergy.
31	Sikakai	Cassia siamea	Leguminaceae	T	Leaf	Soap and shampoo making.
32	Gopi bans	Cephalostachyum capitatum	Gramineae	T	Whole plant	Basket making.

33	Bethe	Chenopodium album	Chenopodiaceae	H	Tender shoot	Plant laxative and Anti-helmentics and eaten as vegetable.
34	Safed musli	Chlorophytum arundinaceum	Liliaceae	H	Roots, tubers	Roots are tonic, Aphrodisiac and are used to general debility tubers are boiled with milk and taken twice a day.
35	Gurzon lahera	Cissampelos pareria	Menispermaceae	C	Stem	Used in diabetes Mellitus and incresly milk production of cows/buffaloes.
36	Kagati	Citrus aurantifolia	Rutaceae	S	Fruit	Edible, pickle making, good source of Vitamin. 'C'
37	Ghar pidalu	Colocasia esculenta	Araceae	H	Corn & leaves	Leaf juice is styptic, stimulant and used in utrinalhemrage, corn juice is laxative.
38	Gol Kakari	Coocinea grandls	Cucurbitaceae	C	Tuber/Fruit	Used in stone.
39	Bhorla	Cordia vestita	Ethretiaceae	C	Fruit	Fruit is demulcent exporant and astringent.
40	Dhaniya	Coriandrium Satirum	Umbleferaceae	H	Whole plant	Aromatic, Flavoring, spices, etc.
41	Leamon grass	Crympogon lexousnas	Liliaceae	H	Leaves	Used in extraction of essential oils.
42	Babio	Culapiopsia binata	Gramineae	H	Whole plant	Used in rope making & thatching / roofing.
43	Ban haledo	Curcuma angustifotia	Zingiberaceae	H	Root (Tuber)	Spices, Abdominal problem, customary.
44	Haldi	Curcuma domestica	Zingiberaceae	H	Root/Tuber	Used as spices and turmeric, root juice taken during common besar cold, clean throat root powder used to color food.
45	Aakeshi beli	Cuscuta reflexa	Unvolvulacea	C	Seed, stem	Seed are antihelmenthis, stem used as caring of bilious disorder and jaundice.
46	Palmrosa	Cymbopogon martini	Gramineae	H	Whole plant	Used in essential oil production.
47	Citronella	Cymbopogon witerianus	Gramineae	H	Whole plant	Used in essential oil production.
48	Mothae	Cyperus rotundus	Cyperaceae	H	Stem	Anti-helmentics and catheterization
49	Sissoo	Dalbergia sissoo	Leguminaceae	T	Leaf, Root and wood	Fodder, Root used in swelling problem. Wood used to make handle of axe and plough.
50	Satisal	Delbrgia latifolia	Leguminaceae	T	Leaf, Wood	Fodder, Wood used to make agricultural implements.
51	Gulmohar	Delonix regia	Fabaceae	T	Flower	Ornamental.
52	Githa	Discoria deltodia	Discoraceae	T	Stem, tuber	Used in fracture, wound and used as vegetable
53	Amala	Phyllanthus emblica	Euphorbiaceae	T	Fruits, leaves	Fruits edible, also used as pickles. Used in Aayurvedic medicines "Triphala" and leaves used as a fodder.
54	Gulab	Rosa alba	Rosaceae	S	Flower	Ornamental.
55	Sudi	Euphorbia royleana	Euphorbiaceae	H	Leaf, Root	Used in live fencing and soil conservation.
56	Dudhe jhar	Euphorbia	Euphorbiaceae	H	Whole plant	Used in medicine.



		thymifolia				
57	Pipal	Ficus bengalensis	Moraceae	T	Bark, leaf	Used in fracture, fodder and religious purpose.
58	Sami	Ficus benjamia	Moraceae	T	Leaf	Ornamental as well as religious purpose.
59	Kabro	Ficus locor	Moraceae	T	Bark, Leaf	Used in rope making and fodder.
60	Dudhal	Ficus neriifolia	Moraceae	S	Leaf, Gum	Fodder and gum used in fracture.
61	Gular	Ficus recemosa	Moraceae	T	Fruit, leaf, gum	Leaf used as very good fodder, fruit are used as medicine, and gum as local flamation.
62	Timla	Ficus roxburghii	Moraceae	T	Fruit , leaf	Fruit are edible possess medicinal value, leaf used as fodder and religious purpose.
63	Khanyo	Ficus Semicordita	Moraceae	T	Root, leaf, fruit	Cooling and used in gonorrhea, jaundice, leaf used as a fodder and fruits are edible.
64	Sauf	Foeniculum vulgare	Umbleferaeen	H	Leaf, whole plant	Leaves are used in fish sauce, used as spice and flavoring.
65	Ban pidalu	Gonatanthus pumilus	Araceae	H	Leaf, Root	Root is used in boils scores wounds and leaves have medicinal value.
66	Vimal	Grewia optiva	Tiliaceae	T	Leaf, fruit	Fodder, fruit edible with medicinal value.
67	Siru	Imperata cylindric	Gramineae	H	Whole plant	Rope making and thatching.
68	Birendra phool	Jacaranda acutifolia	Bigoniaceae	S	Leaf, Bark	Ornamental.
69	Hazari phool	Jagetes erecta	Asteraceae	H	Whole plants	Flowers are pungent and bitter, acrid, astringent, carminative stomachic, blood purifier also used in fever, ulcer, piles and muscular pain.
70	Khirro	Jatropha corocus	Euphorbiaceae	S	Root, sap, seed	Anti-helmentics, live fencing, sap used in Anti-allergy and seeds used for making non edible oil.
71	Chayu	Lactiporus sulphureus	Polyporaceae	F	Whole plant	Edible as vegetable.
72	Bot Dhamiro	Legestromia parviflora	Lytheraceae	T	Leaf	Fodder.
73	Dalae ghash	Leucaena leucophala	Leguminaceae	T	Leaf, Roots	Very nutritive fodder & soil conservation
74	Litchi	Litchi chinensis	Sapindceae	T	Fruit	Edible.
75	Mauwa	Madhuca indica	Sopotaceae	T	Bark, fruit, flower	Used in wine making, diabetes, oil production.
76	Kaulo	Mechilus duthiei	Lauraceae	T	Bark	Used in delivery, menstruation cycle, uterus problem.
77	Bakaino	Melia azedarach	Meliaceae	T	Leaf	Anti-helminthes and fodder.
78	Sindurae	Mellotus phillipinesis	Euphobiaceae	T	Root, fruit, leaf	Anti-helminthes, scabies, making red color and fodder value.
79	Mango	Mengifera indica	Anacardiceae	T	Fruit, Bark	Fruits edible used in

						stomach pain, juice very nutritive.
80	Pudina	<i>Mentha arveusis</i>	Labiateae	H	Whole plant	Used in cold, fever, cough and flavoring.
81	Lajjawati	<i>Mimosa pudica</i>	Leguminoase	H	Root	Used in furuncle and ornamental.
82	Karela	<i>Momor dicaharanita</i>	Cucurbitaceae	C	Root, fruit	Anit-helmitics, piles, diabetes, used as vegetable and stomach disease.
83	Kimbu	<i>Morus alba</i>	Moraceae	T	Fruit, leaf	Edible, leaf used as a fodder and sericulture.
84	Kera	<i>Musa nepalensis</i>	Musaceae	H	Fruit	Fruits edible. Stem juice used in diarrhea and also used to make fermenting material "Marcha".
85	Parijat	<i>Nictanthes arbortristis</i>	Aleaceae	S	Flower	Used in jaundice, fever and ornamental.
86	Tulshi	<i>Ocimum sanctum</i>	Labiateae	H	Whole plant	Used in cough gastritis, and religious purposes.
87	Seudi	<i>Opuntia spp.</i>	Cactaceae	H	Whole plant	Live fencing and Ornamental.
88	Kurkure	<i>Osbeckia stellata</i>	Melastomatomataceae	S	Leaf	Fodder.
89	Chamanil	<i>Oxalis corniculata</i>	Oxalidaceae	H	Whole plant	Used as medicine
90	Bhangiri	<i>Perilla frutescens</i>	Lamiaceae	H	Whole plant	It is sedative, antispasmodic, antiseptic, antidote, used in cephalic, headache and influenza.
91	Jhyu	<i>Permelia nepalensis</i>	Parmeliaceae	Li	Whole plant	Used in food poison, menstruation cycle and flavoring.
92	Salla	<i>Pinus roxburghii</i>	Pinaceae	T	Resin/khoto	Used in fractures and boil.
93	Pipla	<i>Piper langum</i>	Piperaceae	C	Fruit	Fruit edible, Green fruit or dried fruit powder used in cough and cold and spice.
94	Rudilo	<i>Pogostemon bengalensis</i>	Labiateae	H	Leaf juice	Used in cough and fever.
95	Laherae pipal	<i>Populus ciliata</i>	Moraceae	T	Leaf	Fodder.
96	12 O'Clock flower	<i>Portulaca oleararaceae</i>	Fabaceae	H	Whole plant	Used is ornamental
97	Aru	<i>Prunus persica</i>	Rosaceae	S	Fruit	Fruit are edible.
98	Amba	<i>Psidium gauvaja</i>	Myratecae	T	Fruit	Fruit are edible and Young shoot juice taken during diarrhoea. Leaf juice used to make fermenting material "marcha".
99	Vijayasal	<i>Pterocapus marsipium</i>	Leguminaceae	T	Leaf, gum	Leaves used as good fodder, and the tree gum is used as blood purifier and helps in menstruation cycle.
100	Anar	<i>Punica grantum</i>	Punicaceae	S	Fruit	Edible and juice used in reducing blood pressure.
101	Naspati	<i>Pyrus cmmumsis</i>	Rosaceae	T	Fruit	Fruit are edible.
102	Sarpagahdha	<i>Raulvofia serpentine</i>	Apocynaceae	H	Rhizome/Root	Antihypertensive, sedative and used in reducing blood pressure.
103	Arand	<i>Ricinus cummuninsis</i>	Euphorbiceae	S	Seed	The seed produces a types of oil, used in various purpose (not edible)
104	Halhale Sag	<i>Rumex hepolnsis</i>	Polygonaceae	H	Leaf	Edible as vegetable

105	Kans	<i>Saccharum spontanum</i>	Gramineae	H	Whole plant	Used in roofing and religious purpose.
106	Kushum	<i>Scheleria oleosa</i>	Sapindaceae	T	Leaf and fruit	Fodder and seeds are edible.
107	Sal	<i>Shorea robusta</i>	Dipterocarpaceae	T	Leaf, bark, sal dhup seed oil	Bark is used as dyes, and leaves are used plate/Doona making seed oil used as cooking.
108	Kantkari	<i>Solanum virginium</i>	Solanaceae	S	Fruit	Used in common cold, headache, asthma and fever.
109	Ritha	<i>Spandius mokurossa</i>	Sapindaceae	T	Fruit	Soap and shampoo making.
110	Odal	<i>Sterculia villosa</i>	Streculiaceae	T	Leaf	Fodder.
111	Jamun	<i>Syzizyum cumini</i>	Myrtaceae	T	Fruit	Aayurvedic medicine, used in Blood purifying dysenteric.
112	Saipatri	<i>Tagets minuta</i>	Compositae	H	Flower	Used in decoration and ornamental.
113	Sagwan	<i>Tectona grandis</i>	Vevrinaceae	T	Leaf, root	Soil amelioration.
114	Asna	<i>Terminalia tomentosa</i>	Combretaceae	T	Bark, leaf	Used in fracture and leaves are used as good fodder.
115	Barro	<i>Terminelia belerica</i>	Combretaceae	T	Fruit, seed	Used in "Triphala" and cough.
116	Harro	<i>Terminelia chebula</i>	Combretaceae	T	Fruit, seed	Used in "Triphala" cough and cold.
117	Amriso	<i>Thysanalaena maxima</i>	Gramineae	H	Whole plant	Soil conservation, Broom and Fodder.
118	Tooni	<i>Toona ciliata</i>	Meliaceae	T	Fruit, Bark, leaf	Used as tonic and good fodder
119	Guitel	<i>Trewia nudiflora</i>	Euphorbiaceae	T	Leaf	Fodder.
120	Simali	<i>Vitex negundo</i>	Verbeaceae	S	Leaf	Used in cough, cold, fever, allergy, gastric and pneumonia.
121	Ashwa gandha	<i>Withania somnifera</i>	Solanaceae	H	Whole plant	Used in ulcer, bronchitis, burn, and also used as uterus problem.
122	Aduwa	<i>Zingiber officinale</i>	Zingiberaceae	H	Root, tuber	Used as spices and used in cold.
123	Bayar	<i>Zizyphus mauritiana</i>	Rhamanaceae	S	Whole plant	Bark juice and stem nodule used in dysentery, fruit-edible. Root used to make fermenting material. Fruit used as fish poisoning.

## 5. Conclusion

This paper divulge that a large number of the ultra poor community continue to generate income, food and medicine from the collection and sale of NTFPs. The district harbors an incredible diversity of NTFPs and the population possesses a sound knowledge on plant resources. A number of recorded species with good market potential are abundantly available. Despite their potential, the contribution of NTFPs to local economy is still negligible. The expanding market opportunities for a wide range of NTFPs is not yet a boon to the rural people living close to the resource base. As found by the present study, effective marketing of NTFPs should be recognised as a major strategy for the sustainable management and utilization of forest resources. Nevertheless, a holistic approach for the domestication

and commercialization of NTFPs should also involve the local community at the grassroots level. The capacity building programmes for the local people and local institutions are very important. The abundance of the species in the forests and their potential in the market offer better opportunity for the development of the NTFPs in the district. They therefore hold a potential for poverty alleviation (FAO 1993). It is recommended to grab the opportunities while addressing the challenges for the sustainable Non-Timber Forest Product management and commercialization of these valuable products.

## 4. Acknowledgements

Authors are thankful to Department of Forestry for providing necessary facilities and encouragement.

Authors are also thankful to members of the Community forestry User Groups for their support in the field data collection and co-operation throughout the study period.

#### Correspondence to:

Nabin Raj Joshi

Department of Forestry and Environmental Science

Kumaun University, Nainital, 263002, India.

[nabin2001@gmail.com](mailto:nabin2001@gmail.com)

#### 5. References

Ahenkan, A. and Boon, E.K. (2008). Enhancing Food Security and Poverty Reduction in Ghana Through Non-timber Forest Products Farming: *Case Study of Sefwi Wiawso District*. Munich: GRIN Publishers.

Bista, S. and Edward, W.L. (2006). Collection and marketing of non-timber forest products in the far western hills of Nepal. *Environmental Conservation*, Vol. 33 (3): 244-255.

Chandrasekharan, D. (1996). NTFPs, Institutions, and Income Generation in Nepal: Lessons for Community Forestry. Kathmandu: International Centre for Integrated Mountain Development.

Cunningham, A.B. (2001). Applied Ethnobotany: People, Wild Plant Use and Conservation. London, Earthscan: People and Plants Conservation Series.

Dhillon, S.S. and Amundsen, C. (2000). Bioprospecting and the maintenance of biodiversity. In: H Svarstad, SS Dhillon (Eds.): *Responding to Bioprospecting: From Plants in the South to Medicines in North*. Oslo: Spartacus Forlag, pp. 103–131.

Edwards, D.M. (1996). Non-timber Forest Product from Nepal: Aspects of the Trade in Medicinal and Aromatic Plants. *FORESC Monograph No. 1/96*. Kathmandu: Forest Research and Survey Centre.

FAO, (1993). More than Wood. Forestry Topics Report No. 4. Rome: FAO.

FAO, (2005). The State of Food Insecurity in the World: Eradicating World Hunger Key to Achieving the Millennium Development Goals. Rome: FAO.

FAO, (1995). Non Wood Forest Products for Rural Income and Sustainable Forestry. Rome: FAO.

Gauli, K. and Hauser, M. (2009). Pro-poor commercial management of non-timber forest products in Nepal's Community Forest User Groups: Factors and success. *Mountain Research and Development*, Vol 29 (4): 298-307.

Gemedo-Dalle, T. B, Maass, L. and Isselstein, J. (2005). Plant biodiversity and ethnobotany of Borana Pastoralists in Southern Oromla, Ethiopia. *Economic Botany*, Vol 59: 43–65.

Ghimire, S.K, McKey, D. and Thomas, Y.A. (2005). Conservation of Himalayan medicinal plants: Harvesting patterns and ecology of two threatened species, *Nardostachys grandiflora* DC. And *Neopicrorhiza scrophulariiflora* (Pennell) Hong . *Biological Conservation*, Vol.124: 463-475.

Government of Nepal (GoN), (2004). Herbs and Non-timber Forest Product Development Policy [in Nepali]. Kathmandu, Nepal: Department of Plant Resources.

Hara, H. Charter, A.H. and Williams, L.H.J. (1982). **An Enumeration of the Flowering Plants of Nepal**. Vol.III. London: British Natural History Museum.

Hara, H. and Williams, L.H.J. (1979). **An Enumeration of the Flowering Plants of Nepal**. Vol. II. London: British Natural History Museum.

<http://www.fao.org/DOCREP/005/Y4586E/y4586e08.htm> (Retrieved October 4, 2007).

Huntington, H.P. (2000). Using traditional ecological knowledge in Science: Methods and applications. *Ecological Application* Vol. 10: 1270-1274.

Kanel, K. R. (1999). Analysis of Policy and Regulatory Constraints in the Development of Non-timber Forest Products in Nepal. A Report. USA: World Wildlife Fund.

Kunwar, R.M. and Duwadee, N.P.S. (2003). Ecology and economy of NTFPs in Nepal: A case Study from Dolpa and Jumla Districts, Nepal. *Botanica Orientalis*, Vol 3: 89-97.

Manandhar, N.P. (2002). **Plants and People of Nepal**. Oregon: Timber Press.

Martin, G. J. (1995). **Ethnobotany: A Methods Manual**. London: Chapman and Hall.

Mbuvi, D. and Boon, E. (2009). The livelihood potential of non-wood forest products: The case of Mbooni division in Makueni District, Kenya.

*Environment, Development and Sustainability*, Vol11: 989-1004.

Narendran, K. Murthy, I. K. Suresh, H.S. Dattaraja, H.S. Ravindranath, N.H, Sukumar, R.(2001). Non-timber forest product extraction, utilisation and valuation: A case study from the Nilgiri Biosphere Reserve, Southern India. *Economic Botany*, Vol 55(4): 528-538.

Olsen, C.S. (1998).The trade in medicinal and aromatic plants from central Nepal to northern India. *Economic Botany*, Vol. 52(3): 279-292.

Polunin, O., Stainton, A. (1984). **Flowers of the Himalaya**. New Delhi: Oxford University Press.

Press, J.R. Shrestha, K.K. and Sutton, D.A. (2000). **Annotated Checklist of Flowering Plants of Nepal**. London: British Natural History Museum.

Rawal, R.B. (1997).Status of Commercialization of Medicinal and Aromatic Plants of Nepal. In: M. Karki, A.N Rao, VR Rao, JT Williams (Eds.): *The Role of Bamboo, Rattan and Medicinal Plants in Mountain Development*. Proceedings of a Workshop Held at the Institute of Forestry, Pokhara, Nepal, 15-17, May, 1996. INBAR Technical Report No. 15, New Delhi:

International Development Research Centre, pp. 174-188.

Rossato, S. C. Leitao-Filho, H. F and Begossi, A. (1999). Ethnobotany of Caiçaras of the Atlantic Forest Coast (Brazil). *Economic Botany*, Vol. 53(4): 387-395.

Schippmann, U. Cunningham, A.B. and Leaman, D.J. (2002). Impact of Cultivation and Gathering of Medicinal Plants on Biodiversity: Global Trends and Issues. In: *Biodiversity and the Ecosystem Approach in Agriculture, Forestry and Fisheries*. Rome: FAO. <From <  
<http://www.fao.org/DOCREP/005/Y4586E/y4586e08.htm>> (Retrieved October 4, 2007).

Shrestha, K.K. Tiwari, N. N. Rajbhandary, S. Poudel, R.C. Uprety, Y. (2004). *Ethnobotany in Nepal: Review and Perspectives*. Kathmandu: WWF-Nepal.

UNDP. (2004). *The Equator Initiative: Money Grows on Trees*. Cameroon Series 5, New York: UNDP.

Uprety, Y. Boon, E.K. and Poudel, R.C. (2008). *Traditional Use of Plant Resources by Bankariya Ethnic Group in Makwanpur District, Central Nepal*. Germany: GRIN Publisher.

26/10/2010