

# Potentiality of income generation through Non-timber Forest Products: A case study from the Sallipatan Trishakti Community Forest, Bajhang district, Nepal

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## ABSTRACT

*Non-timber Forest Products are the major source of livelihood support for rural communities in Nepal. A case study was performed to determine the potentiality of income generation through Non-timber Forest Products (NTFPs) in the Sallipatan Trishakti community forest of Bajhang district, Nepal from February to April 2020. The Questionnaire surveys, key informant surveys, focus group discussions and forest resource inventory have been used for the data collection. A total of 37 species of NTFPs from 31 families were identified out of which only five species were found to have high market potential. *Xanthoxylum armatum* (Timur), *Phyllanthus emblica* (Amala), and *Cinnamomum tamala* (Tejpat) were found in good frequency and have a good market but the yearly earnings and the number of households involved were low. *Bergenia ciliate* (Pakhanbed), *Valeriana jatamansi* (Sugandhawal), and *Rhododendron arboretum* (Lali gurans) were present in high density in the forest and have high market value but locals didn't prefer and market them due to lack of knowledge and processing technology. Among the total respondents, 59% collect NTFPs for household purposes, 30% for selling purposes, and 11% for traditional uses. *Pinus roxburghii*, *Myrica esculenta*, *Swertia chirayita*, *Rhododendron arboretum*, *Cinnamomum tamala*, *Drepanostachyum* sps., *Asparagus racemosus* and *Taxus wallichiana* would have the potentiality for small scale business from the community forest if they were promoted and managed properly.*

**Keywords:** *Cinnamomum tamala*, MAPs, NTFPs, *Phyllanthus emblica*, *Xanthoxylum armatum*,

## INTRODUCTION

All the products which may be derived from the forest other than the timbers are Non-timber forest products (NTFPs); also known as minor forest products (Ahenkan and Boon, 2011). NTFPs are broadly divided into two groups; consumptive (can be used directly) and non-consumptive (have indirect benefits). They comprise medicinal and aromatic plants (MAPs), bamboo, rattan, papers, dyes, wild foods, soap, detergents, resin, fibers, and others (Hammet, 2004). The diverse geographic and climatic conditions within small areas result in a wide range of biodiversity richness in Nepal. About 11,971 flora are recorded from Nepal which accounts for 3.2 % of the total flora in the world (GON, 2014). Nepal is very rich in NTFPs; about 700 plants are used as medicine, 440 plants as wild food, 30 plants as spices, and 71 plants as fibers (Subedi et al., 2014). Forest regulation (1995) has categorized NTFPs into eight different categories; fruits and seeds (65), roots and rhizomes (48), leaves/stem (30), bark (25), the whole plant (21), flower and fur (16), gum, resin and lac (8), and others (24) in Nepal (GoN/MoFSC, 1995). People use the NTFPs in various ways such as medicine, nutrition, forage, energy, fibers, resins, and oils (FAO, 1991).

NTFPs have a significant role in sustaining rural livelihoods, poverty alleviation, and economic growth of rural communities worldwide (Giri et al., 2001; Angelsen et al., 2014; Shackleton and Pullanikkatil, 2018; Reta et al., 2020). They have a potential capability to ensure food insecurity and reduce malnutrition in indigenous rural communities (Shrestha, 2020). In Nepal, about 80% of the rural population depends on the NTFPs to sustain their livelihood. The NTFPs sub-sector contributes 5% of the national GDP out of the 15% contribution from the forestry sector (Pyakurel and Baniya, 2011). ANSAB (Asia Network for Sustainable Agriculture and Bioresources) has reported that around 189,000 are employed in this sub-sector drawing between 15 and 50% of their household income (Karki and Bhattarai, 2012; MSFP, 2014). Department of Forest (2016) stated that 6.56% of the royalty from the forest sector was contributed from NTFPs. About 150 NTFPs are traded in the international market from Nepal (Shrestha et al., 2020). Roughly 10,000-15,000 tons of NTFPs (more than 100 species) are harvested and traded to the Indian and overseas markets drawing around US\$ 8.6 million annually (Edward, 1996). NTFPs sub-sector can create an opportunity for job employment and income-raising opportunities for those local people; reducing youth migration for jobs (Karki and Bhattarai, 2012).

Master Plan for Forestry Sector (1988) had given priority to revenue generation through NTFPs. The Forest Sector Policy (2015) also focuses on NTFPs to contribute to the rural livelihood and emphasized their research and study (MoFSC, 2015). There are very little researches in Nepal concerning the potential of NTFPs in community forests and no such

research has been made at the study site. Hence, this study aims to determine the potentiality of income generation through NTFPs to the livelihoods of the local people and to rank the five most important NTFPs according to income generation potentiality and the user's preferences in the community forest.

## **MATERIALS AND METHODS**

### **Study area**

The study was conducted in the Bajhang district of Nepal (N 29°29' to 30°9' and E 80°46' to 81°34') from February to April 2020. It extends over 3,42,200 hectare area between altitude ranges of 915 m to 7035 m (from sub-tropical to alpine) in Far-Western Province (Dhurba Bijaya et al., 2020; Sing et al., 2020). The study was mainly focused on Sallipatan Trishakti Community Forest. The CF is located in wards number 4 and 5 of Jayaprithvi Municipality; north of the Khaptad National Park. The CF lies in a rolling terrain covering an area of 610.43 hectares and was formulated in 2061/03/18. The Community Forest User Group (CFUG) comprises 282 households. The ethnic composition consists of Chhetri (major), Brahmin, Thakuri, Dalit, and other groups. The major tree species found in the forest are *Phyllanthus emblica* (Amala), *Rhododendron arboretum* (Lali gurans), *Quercus thomsonian* (Phalant), *Myrica esculenta* (Kafal), *Pinus roxburghii* (Khote salla), *Alnus nepalensis* (Uttis), and *Toona ciliate* (Tooni).

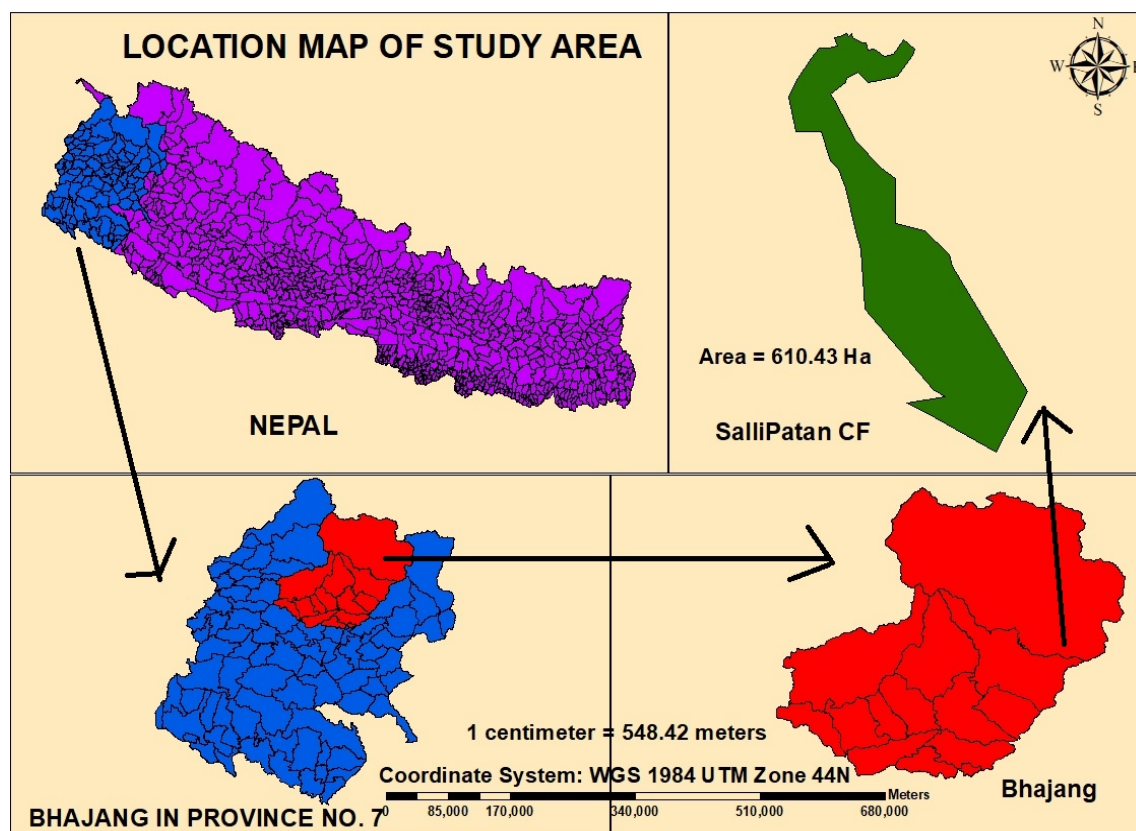


Figure 1: Map of the study area

## Data collection

The primary data were collected through a questionnaire survey, semi-structured interview, focus group discussion (FGD), direct observation, participatory resource mapping, and preference ranking. A total of 28 Households selected randomly were taken for the questionnaire survey. Out of which, 14 households were represented by males and 14 households represented by females. It helped to get a glimpse of the socio-economic status of the users, a listing of the NTFPs, their uses, status, existing income-generating activities based on NTFPs, and preference ranking of prioritized NTFPs with the set criteria. Key informants' interview was carried out with the local forest ranger, leader, teachers, elders, and executive committee members to get information about the NTFPs resources, their existing condition and uses. FGD was carried out with the CFUG during their annual general assembly. Also, participatory resource mapping was carried out during the FGD to assess and list the NTFPs in the study area. Matrix Preference and Pairwise Ranking was carried out for the selection of the prioritized species and potential of income generation. Matrix ranking was carried out by assigning value using the Likert scale against particular characteristics of potential NTFPs. The Pairwise ranking procedure was worked by maintaining a name of more preferred NTFPs in a cell out of two compared species.

The secondary data were collected from published and unpublished documents, articles, and reports which were assessed through Google scholar and Research gate (Gautam et al., 2020; Miya et al., 2020; Timilsina et al., 2020).

### Data analysis

The data were pooled and analyzed with SPSS software. The matrix preference ranking was done based on Matrix preferences ranking criteria (Table 1) for the potentiality of income generation.

**Table 1:** Matrix preferences ranking criteria

S.N.	Criteria	Scale/Value		
		1	2	3
<b>1.</b>	<b>Economy/Market</b>			
a.	Market demand	Low	Moderate	High
b.	Profit	Low	Moderate	High
<b>2.</b>	<b>Ecology/Environment</b>			
a.	Availability (in time)	Seasonal	Occasional	Always
b.	Availability (in space)	Low	Moderate	Widespread
c.	Time needed to find and harvest	Long	Moderate	Short
d.	Impact of harvesting on survival of the species	High	Moderate	Minimum
e.	Regenerative potential	Low	Moderate	High
<b>3.</b>	<b>Social/Institutional</b>			
a.	Contribution to income	Low	Moderate	High
b.	Potential for income generation/ employment	Low	Moderate	High
c.	Equal Benefit distribution to the community	Limited	Reasonable	Well
d.	Women’s participation in business and use	Only men	Both	Only women
e.	Uses	Single-use	Medium	Diverse
<b>4.</b>	<b>Science/Technology</b>			
a.	Processing technology	Sophisticated	Mechanical	Manual/local
b.	Expertise needed for using processing technology	Low	Moderate	High

(Source: Thakur, 2005; Danekhu et al., 2018)

If the range of average rank of the top five NTFPs falls within 0-1.5, it is low potential, and it is medium and high if falls within 1.5-2.5 and >2.5 respectively. The average rank of each top five NTFPs is calculated by dividing the sum of criteria ranking for each NTFP by the number of criteria.

### RESULTS

A total of 37 species of NTFPs from 31 families has been recorded in the present study. The scientific name, local name, family name, and their local uses are given in Table 1. Only five NTFPs (*Phyllanthus emblica*, *Justicia adhatoda*, *Zanthoxylum armatum*, *Cinnamomum tamala* and *Juglans regia*) were the most market potential and more easily available NTFPs which were examined using the matrix ranking (Table 3). A pairwise ranking of these five species was carried out based on resource availability, local uses, and the market separately and the results are presented in Table 4. The highest number of species were used for medicinal purposes (24 species) followed by food purposes (16 species). Families- Asteraceae (three species) and Poaceae (three species) represented the higher number of species followed by Lauraceae (two species) and Urticaceae (two species).

**Table 2:** NTFPs of Sallipatan Trishakti CF and their local uses

S.N.	Scientific Name	Local Name	Family name	Local Uses
1.	<i>Agaricus biosporus</i>	Chyau	Agaricaceae	Medicine, food
2.	<i>Allium wallichii</i>	Ban Lasun	Amaryllidaceae	Food/Spice
3.	<i>Alnus nepalensis</i>	Uttis	Betulaceae	Medicine
4.	<i>Artemisia indica</i>	Titepati	Asteraceae	Medicine
5.	<i>Bambusa sps.</i>	Bans	Poaceae	Making daily use products like a basket.
6.	<i>Berberis ariststa</i>	Chutro	Berberidaceae	Medicine
7.	<i>Bergenia ciliata</i>	Pakhanbed	Saxifragaceae	Medicine for urinary stone
8.	<i>Cinnamomun tamala</i>	Tejpat	Lauraceae	Medicine, Spice
9.	<i>Coriaria nepalensis</i>	Machaino	Coriariaceae	Food
10.	<i>Cynodon dactylon</i>	Dubo	Poaceae	Religion
11.	<i>Diplokenema butyreace</i>	Khirlo	Sapotaceae	Medicine
12.	<i>Drepanostachyum sps.</i>	Nigalo	Poaceae	Food, Handicrafts
13.	<i>Dryoathyrium boryanum</i>	Kali Neuro	Pteridaceae	Food
14.	<i>Dryopteris filix-mas</i>	Neuro/Fern	<i>Dryopteridaceae</i>	Food
15.	<i>Eclipta prostrata</i>	Bhirangaraj	Asteraceae	Medicine, oil for hair medicine
16.	<i>Eupatorium adenophorum</i>	Banmara	Asteraceae	Bio briquette (fuel), Medicine (juice cuts and wounds)

17.	<i>Girardinia diersifolia</i>	Aaloo	Urticaceae	Medicine
18.	<i>Juglans regia</i>	Okhar	Juglandaceae	Medicine
19.	<i>Justicia adhatoda</i>	ashuro	Acanthaceae	Medicine
20.	<i>Lichen sp.</i>	Jhyau	Parmeliaceae	Medicine, Aesthetic value
21.	<i>Mentha arvensis</i>	Pudina	Lamiaceae	Spice, Medicine (stomach and breath problems)
22.	<i>Moringa olifera</i>	Setak Chini	Moringaceae	Medicine
23.	<i>Myrica esculenta</i>	Kaphal	Myricaceae	Food, Medicine (Bark for stomach ailments)
24.	<i>Oxalis corniculata</i>	Charimilo	Oxalidaceae	Medicine, Dye, Food
25.	<i>Persea odoratissima</i>	Kaulo	Lauraceae	Used for the adhesive purpose
26.	<i>Phyllanthus emblica</i>	Amala	Phyllanthaceae	Food, Medicine (leaves for Stomach and Skin diseases)
27.	<i>Pinus roxburghii</i>	Khote salla	Pinaceae	Resin, Medicine, turpentine
28.	<i>Piper Longum</i>	Pipli	<i>Piperaceae</i>	Fruit, Spice
29.	<i>Rhododendron arboretum</i>	Lali gurans	Ericaceae	Food, Medicine
30.	<i>Rubus ellipticus</i>	Ainselu	Rosaceae	Food
31.	<i>Sapindus mukorossi</i>	Ritho	Sapindaceae	Used in manufacturing of soap
32.	<i>Swetia chirayita</i>	Chiraito	Gentianaceae	Medicine (fever and bile problems)
33.	<i>Taxus wallichiana</i>	Lauth Salla	Taxaceae	Medicine (for cancer patients)
34.	<i>Tinospora sinensis</i>	Gurjo	<i>Menispermaceae</i>	Medicine
35.	<i>Urtica dioca</i>	Sisnu	Urticaceae	Food, Medicine
36.	<i>Valeriana jatamansi</i>	Sughandawal	Caprifoliaceae	Scented oil
37.	<i>Zanthoxylum armatum</i>	Timur	Rutaceae	Spice

**Table 3:** Matrix ranking of Prioritized NTFPs

S.N.	Criteria	Species				
		Amala	Ashuro	Timur	Tejpat	Okhar
<b>1.</b>	<b>Economy/Market</b>					
a.	Market demand	3	1	3	2	2
b.	Profit	2	1	3	2	3
<b>2.</b>	<b>Ecology/Environment</b>					

a.	Availability (in time)	1	3	1	2	1
b.	Availability (in space)	1	3	1	1	2
c.	Time needed to find and harvest	3	3	2	2	3
d.	Impact of harvesting on the survival of species	3	3	3	3	3
e.	Regenerative potential	3	1	3	1	2
<b>3. Social/Institutional</b>						
a.	Contribution to income	2	1	2	2	2
b.	Potential for income generation/employment	3	2	3	3	3
c.	Equal Benefit distribution to community	2	2	2	2	2
d.	Women's participation in business and use	2	3	2	2	3
e.	Uses	3	3	2	2	1
<b>4. Science/Technology</b>						
a.	Processing technology	3	3	3	3	3
b.	Expertise needed for using processing technology	1	1	1	1	2
<b>Total</b>		32	30	31	28	37
<b>Average (total/no. of criteria)</b>		2.28	2.14	2.21	2	2.64



**Table 4:** Pairwise ranking of Prioritized NTFPs

1. On the basis of resource availability

Species	Amala	Ashuro	Timur	Tejpat	Okhar
Amala	Amala	Ashuro	Amala	Amala	Amala
Ashuro	Ashuro	Ashuro	Ashuro	Ashuro	Ashuro
Timur	Amala	Ashuro	Timur	Tejpat	Okhar
Tejpat	Amala	Ashuro	Tejpat	Tejpat	Okhar
Okhar	Amala	Ashuro	Okhar	Okhar	Okhar

2. On the basis of market availability

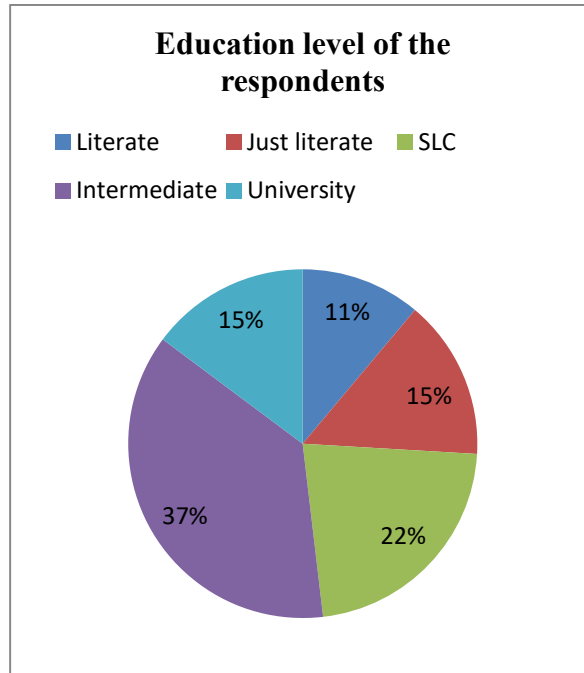
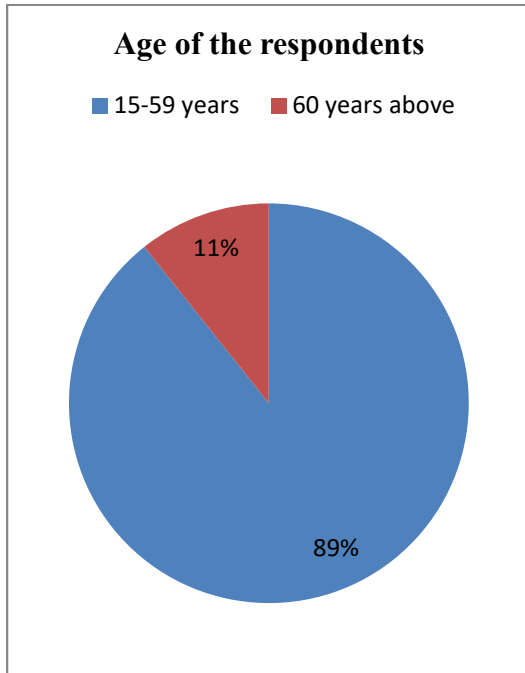
Species	Amala	Ashuro	Timur	Tejpat	Okhar
Amala	Amala	Amala	Amala	Amala	Amala
Ashuro	Amala	Ashuro	Timur	Tejpat	Okhar
Timur	Amala	Timur	Timur	Timur	Timur
Tejpat	Amala	Tejpat	Timur	Tejpat	Okhar
Okhar	Amala	Okhar	Timur	Okhar	Okhar

3. On the basis of local use

Species	Amala	Ashuro	Timur	Tejpat	Okhar
Amala	Amala	Amala	Amala	Amala	Amala
Ashuro	Amala	Ashuro	Timur	Tejpat	Okhar
Timur	Amala	Timur	Timur	Tejpat	Okhar
Tejpat	Amala	Tejpat	Tejpat	Tejpat	Okhar
Okhar	Amala	Okhar	Okhar	Okhar	Okhar

## DISCUSSION

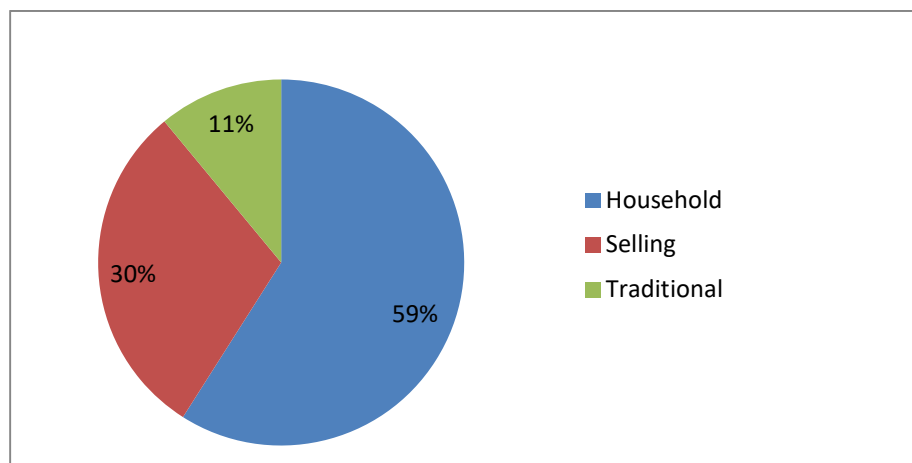
The respondents in the household survey were mostly from the age group of 15-59 with an education level of intermediate and the sexes were nearly evenly distributed. Only 11% of the respondents were illiterate (most of the illiterate were of a higher age group) (Figure 2 and Figure 3).



**Figure 2:** Age group of the respondents

**Figure 3 :** Education level of the respondents

Subedi et al. (2014) have estimated at around 40,000 forest-based enterprises in Nepal and ANSAB has reported about 1,89,000 people employing in the NTFPs sub-sector drawing between 15-50% of their household income in Nepal (Karki and Bhattarai, 2012; MSFP, 2014). But there was low rate of involvement of the respondents in the collection and sale of the NTFPs; with only five households involved in the business; no NTFPs based enterprise/industry existing in the study area. However, the respondents' participation was high in community forests and consequently, NTFPs management activities like thinning, pruning and planting among the respondents with 22 respondents responding of regular participation in such activities. Giri and Ojha (2010) reported that increased participation and empowered local institutions like CFUGs generate livelihood outcomes automatically. NEHHPA (Nepal Herbs and Herbal Products Association) has estimated about 50% of local communities involving in the collection and trade NTFPs in Nepal (Kalauni and Joshi, 2018). Among the total respondents, 59% collect NTFPs for household purposes, 30% for selling purposes and 11% for traditional uses in the present study area (Figure 4). Maharjan and Dangal (2020) have also reported a higher number of respondents collecting NTFPs for household consumption (43%) followed by treatment (30%) and trade (27%) in the Dolakha district.



**Figure 4:** Purposes of NTFPs collection

Forests are sources of earnings and multiple products to people living near them (Rahut et al., 2016). In Nepal, around 143-161 types of NTFPs are collected and harvested for commercial purposes (Bhattarai and Ghimire, 2006; Subedi, 2006). In the present study, the NTFPs were used for seven different categories (purposes). Among the total 37 species of NTFPs, 24 species were used for medicine, followed by food (16 species), essential oils (three species), religious and aesthetic (two species), handicrafts (two species), dye (one species), bio-briquette (one species), adhesive (one species) and soap (one species) (Figure 5). *Swertia chirayita*, *Rhododendron arboretum*, *Cinnamomun tamala*, *Allium wallichii*, *Bergenia ciliata*, *Berberis aristata*, *Artemisia indica*, etc. were used for medicine. *Bauhinia variegata*, *Myrica esculenta*, *Urtica Dioca*, *Coriaria nepalensis*, and *Rubus ellipticus*, etc were used for food (Table 2). The study by Kunwar et al. (2013) has recorded 132 species used for medicine out of 238 plant species recorded from far western Nepal. Our study also supports a majority of NTFPs being used for medicinal purposes. The NTFPs were represented by a total of 31 plant families, out of which Asteraceae (three species) and Poaceae (three species) represented the higher number of species, followed by Lauraceae (two species) and Urticaceae (two species). Other families were represented by a single species for each of them (Figure 6 and Table 2).

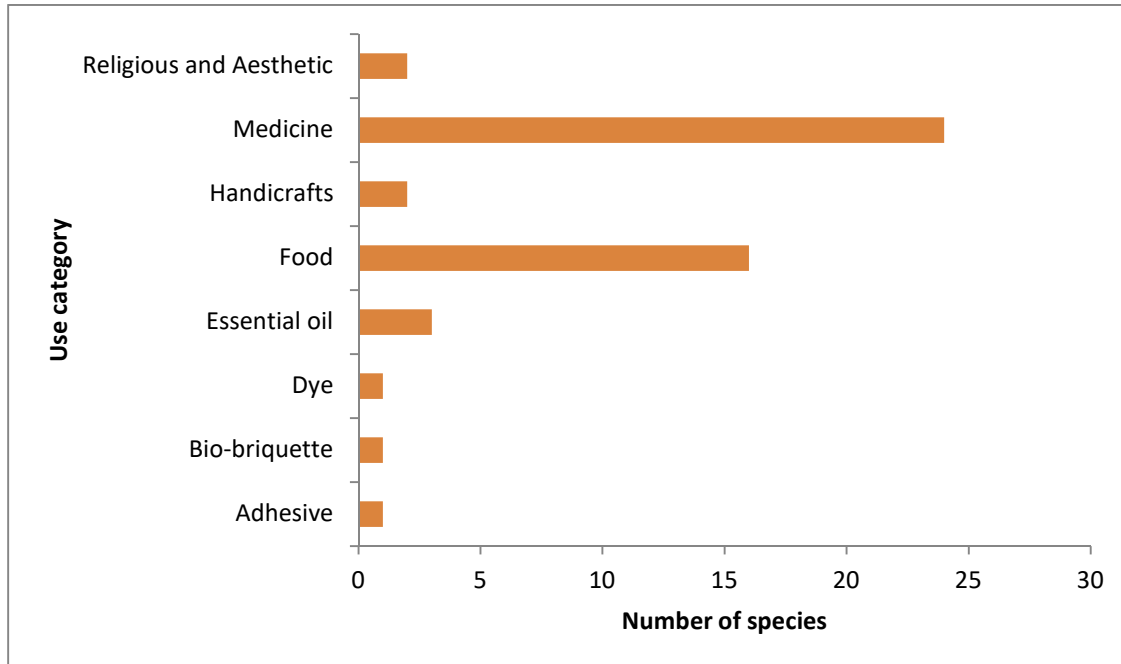


Figure 5: Use categories of NTFPs

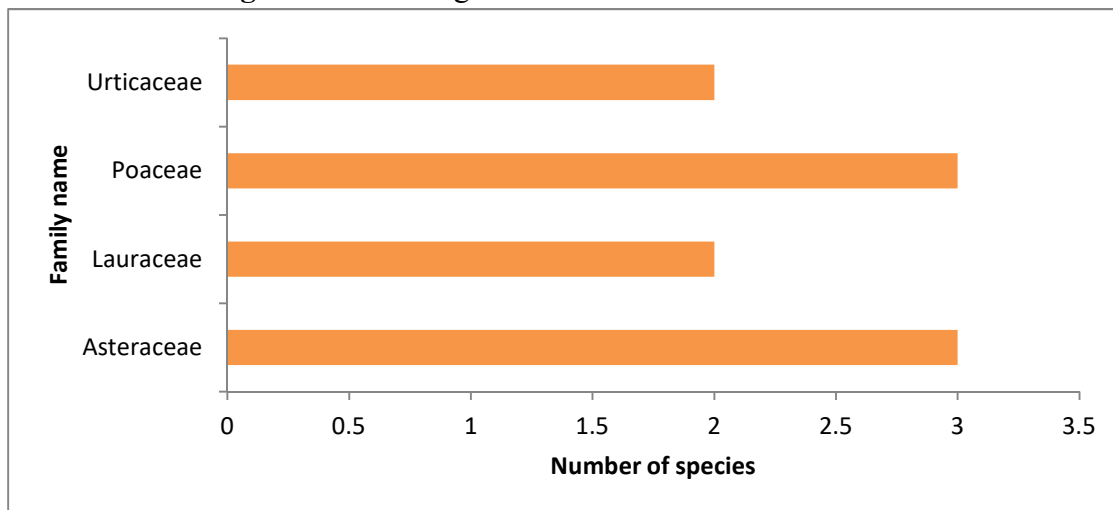


Figure 6: Family-wise species number

The potentiality of income generation from enterprises based on NTFPs was found to be medium with an average rating of top five NTFPs falling in the range of 2-2.64 as there was the medium availability of high market value NTFPs and medium diversity/distribution of other NTFPs that are marketable. The potential of NTFPs according to preference and income generation potential was highest for *Juglans regia* (2.64) with a slightly lower preference value of *Phyllanthus emblica* (2.28). *Zanthoxylum armatum* has a high market value (Rs. 1500-200 per kg) but the locals have a higher preference for *Justicia adhatoda* due to its more diverse use (especially with leaves are used as green manure to increase the production of rice). Also,

*Juglans regia* has a good market value (Rs. 450-500 per Kg) but due to the distant market, people extract oil from *Juglans regia* and use it for cooking and medicine. *Cinnamomum tamala* has the lowest potential (2) due to its lower availability in the area (Table 2 and Table 3). *Phyllanthus emblica* were collected and dried in the sunlight. The contractors come to the collectors and buy which cost Rs, 300-350 per kg. Table 4 indicates that *Justica adhatoda* was available more abundantly followed by *Phyllanthus emblica*. *Phyllanthus emblica* has the highest market availability and highest uses.

Although *Taxus wallichiana* and *Rhododendron arboretum* were present in high density in the forest, these were not marketed and preferred/valued by the locals due to lack of knowledge and processing technology. *Phyllanthus emblica*, *Myrica esculenta*, *Rhododendron arboretum*, *Pinus roxburghii*, *Swertia chirayita*, *Drepanostachyum spp*s, *Juglans regia*, *Zanthoxylum armatum*, and *Berberis aristata* have the potentiality of being the base of a small scale business from the community forest if they should be promoted and proper NTFP management practices were put in practice.

## CONCLUSION

A total of 37 species of NTFPs from 31 families were recorded in the present study. The potentiality of income generation from enterprises based on NTFPs was found to be medium with an average rating of the top five NTFPs falling in the range of 2-2.64. The highest number of species were used for medicinal purposes (24 species) followed by food purposes (16 species). Local people were found to be dependent upon NTFPs for local use rather than their marketing and business purpose. As there were a low diversity of valuable NTFPs, then the promotion of their plantation could be promoted for future uses for income generation. Although the CFUG members and locals did use NTFPs in the area, most of them did not do all such for an income generation and there was no enterprise based on it. Promotion of such enterprises can be done through various awareness campaigns and financial incentives such as tax waivers, local financial institutions providing low amount or no collateral loans for establishing such a structural form of enterprises, etc.

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