

# Non-Timber Forest Products and Livelihood Linkages: A Case of Lamabagar, Nepal

Sandhya Rijal, Saroj Adhikari, Ramesh R. Pant

## I. INTRODUCTION

**Abstract**—Non-Timber Forest Products (NTFPs) have attracted substantial interest in the recent years with the increasing recognition that these can provide essential community needs for improved and diversified rural livelihood and support the objectives of biodiversity conservation. Nevertheless, various challenges are witnessed in their sustainable harvest and management. Assuming that sustainable management with community stewardship can offer one of the solutions to existing challenges, the study assesses the linkages between NTFPs and rural livelihood in Lamabagar village of Dolakha, Nepal. The major objective was to document the status of NTFPs and their contributions in households of Lamabagar. For status documentation, vegetation sampling was done using systematic random sampling technique. 30 plots of 10 m × 10 m were laid down in six parallel transect lines at horizontal distance of 160 m in two different community forests. A structured questionnaire survey was conducted in 76 households (excluding non-response rate) using stratified random sampling technique for contribution analysis. Likewise, key informant interview and focus group discussions were also conducted for data triangulations. 36 different NTFPs were recorded from the vegetation sample in two community forests of which 50% were used for medicinal purposes. The other uses include fodder, religious value, and edible fruits and vegetables. Species like *Juniperus indica*, *Daphne bholua*, *Aconitum spicatum*, and *Lyonia ovalifolia* were frequently used for trade as a source of income, which was sold in local market. The protected species like *Taxus wallichiana* and *Neopicrorhiza scrophulariiflora* were also recorded in the area for which the trade is prohibited. The protection of these species urgently needs community stewardship. More than half of the surveyed households (55%) were depending on NTFPs for their daily uses, other than economic purpose whereas 45% of them sold those products in the market directly or in the form of local handmade products as a source of livelihood. NTFPs were the major source of primary health curing agents especially for the poor and unemployed people in the study area. Hence, the NTFPs contributed to livelihood under three different categories: subsistence, supplement income and emergency support, depending upon the economic status of the households. Although the status of forest improved after handover to the user group, the availability of valuable medicinal herbs like *Rhododendron anthopogon*, *Swertia nervosa*, *Neopicrorhiza scrophulariiflora*, and *Aconitum spicatum* were declining. Inadequacy of technology, lack of easy transport access, and absence of good market facility were the major limitations for external trade of NTFPs in the study site. It was observed that people were interested towards conservation only if they could get some returns: economic in terms of rural settlements. Thus, the study concludes that NTFPs could contribute rural livelihood and support conservation objectives only if local communities are provided with the easy access of technology, market and capital.

**Keywords**—Contribution, medicinal, subsistence, sustainable harvest

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NTFPs are crucial natural resources especially in the mountain region. Majority of rural communities depend on them as a source of food, fodder, fiber, medicine, condiment, dye and other useful materials. In addition, these are considered as important resources for poverty reduction and forest resource development [1]. NTFPs consist of goods of biological origin other than timber or fuel wood derived from forest or other wooded land [2]. A narrower definition of these includes all biological materials other than timber, fodder or phalloid [3]. This study deals with the NTFPs that are derived from forests and are of plant origin.

In the past, NTFPs had been considered secondary in importance to timber and were confined to local economies and very little knowledge existed about them. But, during last two decades utility of NTFPs has emerged with interest as their exploitation is believed to be less destructive than timber harvesting [4]. In the mountainous region of Nepal, 10 to 100% of households are reported to be involved in commercial collection of NTFPs while rural hilly areas are contributed up to 50% of total annual family income [5]. It is estimated that from 7,000 to 27,000 tons of NTFPs, with a value of US dollar 7-30 million, are harvested and traded in Nepal annually [6].

In the recent years, NTFPs have attracted considerable global interest. This is due to the increasing recognition of the fact that these can provide important community needs for improved rural livelihood; contribute to household food security and nutrition; help to generate additional employment and income; offer opportunities for NTFP based enterprises; contribute to foreign exchange earnings; and support biodiversity and other conservation objectives [7]. Among nearly 700 medicinal plant species in Nepal, about 34% are used for general purposes and about 14% for trade use [8].

NTFPs play significant role in the life of many people living nearby forest area who depend on the forest products for food and medicine as well as income and employment, especially for the rural population in the hills and mountains of Nepal. For total Gross Domestic Product (GDP) of Nepal, forestry sector gives 15% income with connection to the NTFPs which is about 45% of the forestry sector's contribution to the GDP [9]. The importance of medicinal plants and other NTFPs has recently been recognized and the potentials for uplifting the rural economy through better management of forest resources including NTFPs have attracted the attention of local

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communities in Nepal. There are many NTFPs present in their wild state in community forests. However, there are various challenges in sustainable conservation and management of NTFPs. Over-harvesting due to trade pressure, livestock grazing/trampling, forest fire and habitat destruction are responsible for the depletion of many species. Sustainable management with community stewardship offers the best solution to these problems.

Community forestry has been a priority program of forestry sector in Nepal for over last two decades in which local communities use rights of the resources and are organized as grass-root level institutions for the proper management of these resources. More specifically, it refers to a component of participatory forestry that focuses on local communities as key stakeholders for sustainability [10]. Most of the community forestry operational plans still emphasize on timber management and hardly mention about NTFPs. A good management of NTFPs would have great potential for contributing to the national poverty alleviation programs while maintaining the diversity of the forest ecosystem under community forest management. Managing NTFPs could also contribute to increase the incomes of the landless and poor. There is no specific policy and legal framework relating to the NTFP sub-sector in Nepal. Although there is provision for the management of medicinal plants in the outline of operational plan stated in the current forestry regulations, no specific guidelines are given in the section for the development of NTFPs [9].

For the better management of CF, proper identification and documentation of NTFPs and reorganization of their traditional

knowledge are important for the formulation of effective policies and programs.

NTFPs can be important source of livelihood to the people living in mountains, however, increased and improper use of the forest resources have put pressure on economically valuable NTFPs. The alternatives to forest products and biomass are not feasible to the rural households in the foreseeable future. Thus, utilization of forest products through appropriate technological intervention is a must for environmental protection and sustainable rural development [11].

Due to poor economy of the rural community and lack of alternative living sources, more pressure is observed on these resources. Hence, it is necessary to explore people's dependency on such forest products along with their potential contribution to livelihood. The study aims to document the status of NTFPs and assess their contributions in households of Lamabagar.

## II. MATERIALS AND METHODS

The study area lies at Lamabagar VDC of Dolakha district (Fig. 1). The region is endowed with rich biological diversity created by 16 vegetation types ranging from sub-tropical chirpine forest to moist alpine scrubs. As the economy of the region is primarily based on farming and animal husbandry, people's dependence on forest and rangelands is quite high. The region is newly established conservation center and hence, enough researches on biological resources are yet to be carried out.

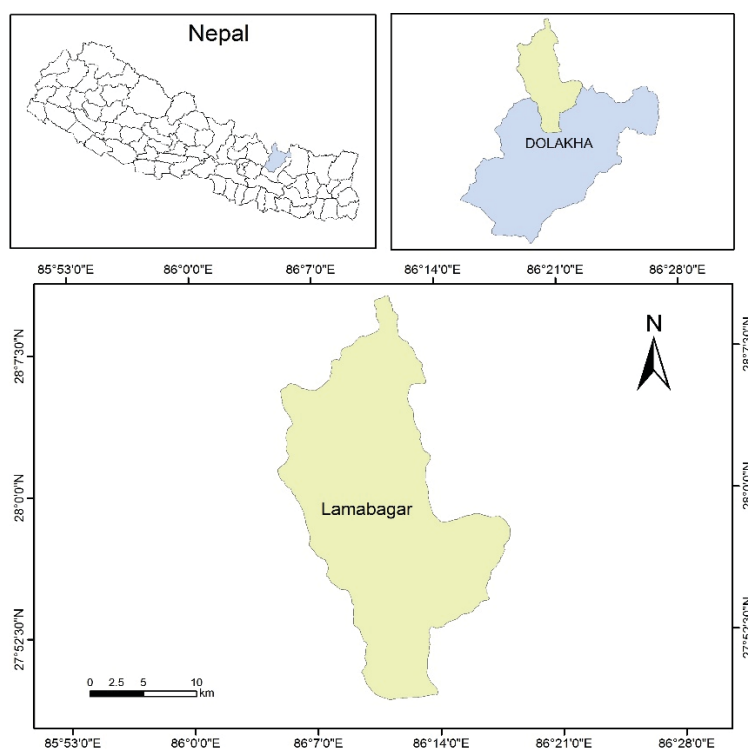


Fig. 1 Map of study area

The area lies at an altitude of 3,106 m asl where NTFPs are found in plenty. Majority of the people here are forest

dependent for their livelihood. The main cause of reliance on forest products is due to its rugged topography where farming is a difficult occupation.

#### A. Data Collection

Required primary data were collected by using several techniques as described below:

##### 1. Transect Survey and Field Sampling

With the guidance and information collected from user committee members, community forest was visited with the user group following the map. A location was selected where most part of the forest was visible to find the starting point of the sampling. Vegetation sampling was done by quadrat method, and the sample quadrates were located by stratified random sampling method. Sample plot size 10m × 10m was taken for shrub, herb and tree. Each sampling plot was set up vertically along the pre-determined parallel transects line. The distance of each parallel line was maintained at horizontal difference of 160 m. First quadrat was laid down by taking river as a reference point at the base of the river and further quadrates were laid down randomly. Altogether, thirty quadrats were laid down along the six parallel transect lines in both the community forest. To support the resource assessment inventory, form was prepared including the information of quadrat number, plot elevation, plot slope and aspect, anthropogenic disturbance, and forest type.

##### 2. Herbarium Preparation and Identification

The identified plants and other encountered plants were collected as specimen for herbarium. Local people were consulted to confirm their identity in terms of vernacular names, uses and other information. Some unidentified plant specimens that were preserved as herbarium were identified with the help of National Herbarium and Plant Laboratories, Godavari and from Central Department of Botany, Nepal. Authentic scientific names and author citation were made with the help of standard books and consultation with experts.

##### 3. House Holds (HHs) Sample Size Estimation

Of the total 361 households in the study area of two community forest user group, a sample of 76 households was surveyed to find the contribution of NTFPs on livelihood of the people. Sample size was determined based on the formula:

$$n = \frac{N \times Z^2 p (1-p)}{N \times d^2 + Z^2 p (1-p)} \quad (1)$$

where, n = Sample Size, N = Total number of households, Z = Value of variance at 95 % (1.96), d = Acceptable error (10%).

From the calculation, the sample size (n) was obtained as 76 and household survey was done. Household survey was conducted to collect the information on different variables like resources exploited from forest and frequency of exploitation based on semi-structured questionnaire. Other information on traditional pattern of NTFPs use, major threats and perception on participatory management of conservation area for

enhancing livelihood capitals and innovative activities of local people were also collected. Informants were selected based on systematic random sampling technique. Key Informants Interview (KII) and Focus Group Discussion (FGD) were also used as data triangulation tools.

### III. RESULTS AND DISCUSSION

#### A. Documentation of the Status of NTFPs

After the handover of local forests to the user group, grazing, illegal felling, forest fire had been significantly controlled, which has improved the forest condition. Varieties of plant species were found growing in their wild state. The transect survey carried out has documented that plant diversity has improved greatly in the forest area. An herbarium of 36 plants specimen was collected. Many NTFPs were used for local purposes. Out of 36 NTFPs recorded, plants were of different habits as trees, shrubs, herbs and climbers. Some plants were found at higher frequency during the vegetation sampling. Various NTFPs with their uses and frequency recorded during vegetation sampling is as shown in Table I.

#### B. Utilization of NTFPs from Community Forest

Local people were depending on NTFPs for food, fodder, fruits, vegetables, building materials, and medicines. With the application of rules mentioned in operational plan of the community forestry, local people were found to collect timber, wood and fodder but there were no specified rules existing for collecting medicinal plants except few banned plants. The study has found that out of 36 recorded NTFPs, 6 were for fodder, 8 for fuel wood, 5 had religious value, 12 as edible fruits, 6 for vegetable and 18 as medicines (Fig. 2). Some were useful for making incense, rope, thatching materials and rest were used for furniture (i.e. decorative purpose, handicraft), spices, tuber, broom etc.

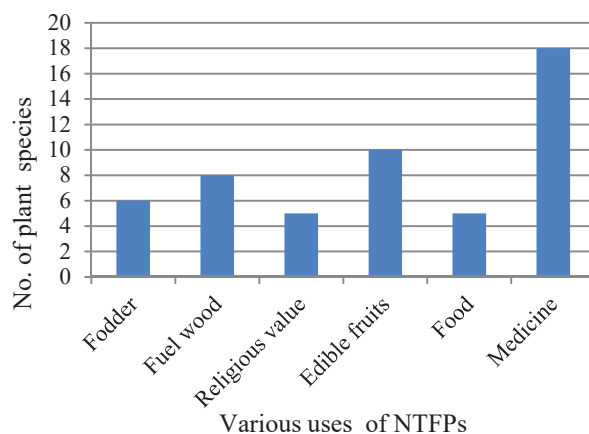


Fig. 2 Various uses of NTFPs

TABLE I  
 LIST OF NTFPs DOCUMENTED

S.N	Vernacular name	Scientific name	Use value
1.	Lokta	<i>Daphne bholua</i> Buch. - Ham.	Commercial
2.	Sugandhawal	<i>Valeriana wallichii</i> DC.	Medicine, commercial
3.	Kutki	<i>Neopicrorhiza scrophulariiflora</i> (Pennell) D.Y.Hong, Opera Bot.	Medicine
4.	Sishnu	<i>Urtica dioica</i> Linn.	Medicine, food
5.	Bamboo	<i>Bambusa tulda</i> Roxb; Fl.	Commercial wood
6.	Ningalo	<i>Drepanostachyum falcatum</i> (Nees) Keng f.,; J Bamboo Res.	Commercial
7.	Satuwa	<i>Paris polyphylla</i> Sm.	Medicine
8.	Sunapati	<i>Rhododendron anthopogon</i> D. Don	Medicine, commercial, fuel
9.	Bishma	<i>Aconitum spicatum</i> Stapf	Medicine
10.	Kurilo	<i>Asparagus racemosus</i> Wildenow, Sp.	Medicine, food
11.	Banmara	<i>Ageratina adenophora</i> (Spreng.) R.M. King and H. Rob.	Fuel, medicine
12.	Bojho	<i>Acorus calamus</i> Linn	Medicine
13.	Chiraito	<i>Swertia nervosa</i> (G.Don) Wall.	Medicine, commercial
14.	Lauth salla	<i>Taxus wallichiana</i> Zucc., Abh.	Commercial, fuel
15.	Padamchal	<i>Rheum nobile</i> J.D. Hooker and Thomson, III.	Medicine
16.	Dhupi	<i>Juniperus indica</i> Bertoloni Misc	Medicine, religious, fuel
17.	Jatamashi	<i>Valeriana hardwickii</i> V.h Wall.	Medicine, commercial
18.	Aiselu	<i>Potentilla peduncularis</i> D. Don	Food
19.	Angeri	<i>Lyonia ovalifolia</i> (Wall.) Drude	Medicine
20.	Chilaune	<i>Schima wallichii</i> Choisy	Fodder, construction
21.	Ban lasun	<i>Allium wallichii</i> Kunth	Medicine, food
22.	Kholme	<i>Symplocos ramosissima</i> Wall. Ex G.Don	Medicine, food
23.	Majitho	<i>Rubia manjith</i> Roxb. Ex Fleming	Medicine, commercial
24.	Argeli	<i>Edgeworthia gardneri</i> (Wall.) Meisn; Denkschr.	Medicine
25.	Khote salla	<i>Pinus roxburgii</i> Roxb., Fl.	Commercial, construction
26.	Dhasingre/ Machino	<i>Gaultheria fragrantissima</i> Wall	Medicine, fuel
27.	Ghittha	<i>Dioscorea bulbifera</i> L.: Sp.PI.	Food
28.	Jhayau	<i>Parmelia</i> sp.	Fodder
29.	Nagbeli	<i>Lycopodium clavatum</i> L.	Medicine
30.	Alaichi	<i>Amomum aromaticum</i> Roxb; Fl.	Food
31.	Amriso	<i>Thysanolaena maxima</i> (Roxb.) Kuntze.; Revis.	Commercial, fodder
32.	Amala	<i>Phyllanthus emblica</i> L., Sp.	Medicine, food
33.	Bhaykur	<i>Dioscorea deltoidea</i> Wall.	Food
34.	Titepati	<i>Artemisia dubia</i> Wall.	Medicine
35.	Bojho	<i>Acorus calamus</i> L., Sp.	Medicine
36.	Bankarelo	<i>Momordica</i> sp.	Food, medicine

The study found that NTFPs are critically important to local forest users as a living source in terms of fulfillment of household medicinal needs rather than trade. Almost all the HHs were directly benefitted from collection and utilization of such forest products. 80% of the HHs used vital NTFPs as source of food and medicines and 20% of them traded such products far in the market. Apart from the NTFPs collected for trade, most of the rural communities used them as medicines where modern health service was difficult to fetch. This was the main cause of rural community to depend on local therapy [12]. The potential contribution of NTFPs can be visualized in three distinct categories in terms of livelihood i.e. subsistence, supplement income or emergency support. In parts of Nepal, up to a quarter of total HH income is derived from sale of NTFPs. In Lamabagar VDC, NTFPs were taken as a source of food, medicine, spices, essential oil, fiber, bamboo products, broom-grass. Data analysis reveals that contribution of medicinal and aromatic plants among the available NTFPs in the study site is far greater than services offered from non-medicinal NTFPs sectors which were also illustrated by previous study [13].

### C. Peoples' Perception on NTFPs Management

Among the respondents, 80% were positive on preserving valuable NTFPs. They were found more enthusiastic to cultivate and manage NTFPs as medicine and prevent the collection of species without permission. However, 20% were not much idealized about such plant species preservation (Fig. 3).

Mostly the poor and unemployed were dependent on NTFPs for curing primary health ailments. The study has found that different users had different preferences. 80% prioritized for medicinal and domestic purposes and remaining 20% on market sell as shown in (Fig. 4).

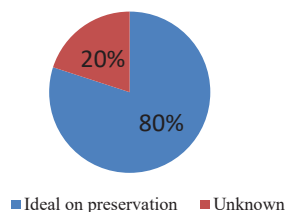


Fig. 3 Peoples' perception on NTFPs management

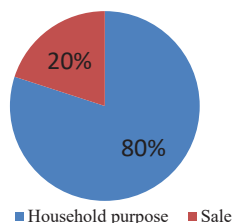


Fig. 4 NTFPs preference by the respondents

#### D. Current Status of the NTFPs and Major Threats in Forest

Although the status of forest was found improving with the handover of forest to the user group, but the availability of valuable medicinal herbs like *Rhododendron anthopogon*, *Swertia nervosa*, *Neopicrorhiza scrophulariiflora*, and *Aconitum spicatum* were found to be declining. 70 % of the respondents revealed that encroachment of the forest for timber collection to be the major reason for that while 10% of the people blamed for forest fire to destroy such valuable herbs. Remaining 5 % argued that for increasing number of consumers in the forest while 10% reported for overharvesting of such herbs illegally by the traders (Fig. 5). People claimed for increasing number of hotel entrepreneurs and problem of tax collection for medicinal herbs to be the fatal threats of forest management.

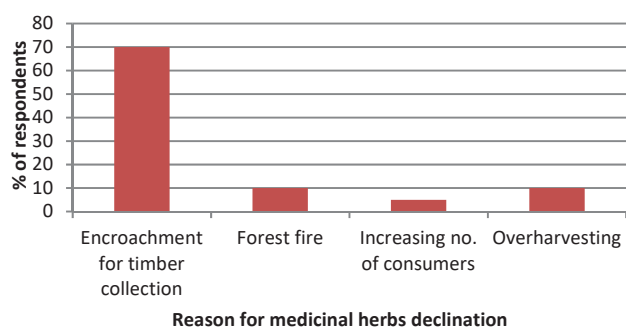


Fig. 5 Causes of decline of medicinal herbs in the forest

#### E. Alternative Income Generating Activities

Local people were directly and indirectly linked with forest resources as an important source of their living. Of the total respondents, 80 % of the people sell the timber woods and fuelwoods to earn the currency while 20% of the respondents sell NTFPs to earn their living (Fig. 6). Especially, people make traditional nepali tools like *Doko*, *Damlo*, *Thunse*, *Dalo* as finishing goods from NTFPs like *Drepanostachyum falcatum*, *Bambusa tulda*, *Abies spectabilis* and sell in the market. People make incense (Dhup) from *Juniperus indica*, *Rubus ellipticus*

and sell them. Likewise, *Allium wallichii*, *Paris polyphylla*, *Aconitum spicatum*, *Cordycep sinensis* (collected once in every 3 years), *Swertia nervosa*, *Rhododendron anthopogon*, *Rubus ellipticus* were valuable NTFPs used by the local people for business purpose.

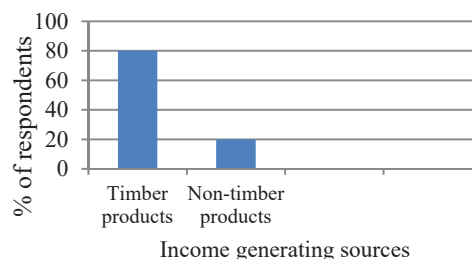


Fig. 6 Dependency on various forest products for income generation

#### IV. CONCLUSION

NTFPs have served as vital medicinal agent and source of income of the local people. The reliance of people on folk medicines for health care is associated with the remoteness of the locality, poverty among dwellers and traditional belief of its effectiveness. Only 20% of people were benefitted in earning income from external trade. Thus, the findings of study clearly provide evidence that NTFPs comprising medicinal plants have vital role in the health cure of rural community.

All the forest management practices including control of composition and structure of growing stock and harvesting and distribution of forest products were strictly implemented, and people were found actively involved in these management activities as they were getting the regular flow of the products for their daily needs in a continuous basis which had contributed to enhance their livelihood needs. Improvement of livelihood of local community by utilization and at the same time, conservation of natural resources is a must and an integral part of the environmental sustainability which the study deals with.

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