

Role of Non-Timber Forest Products in National Economy: A Case of Jajarkot District, Nepal

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Abstract

Non-timber forest products are the major source of income for mountainous countries like Nepal. This article attempts to explore a case of traded non-timber forest products (NTFPs) in Jajarkot district and its contribution to the economy. Collection of medicinal and aromatic plants (MAPs) and resin tapping are some of the major sources of employment for a large number of rural people. 53 different types of NTFPs are traded from the Jajarkot district. Local people collect these NTFPs from the forest and export them within and outside the district mainly to India and China. Jajarkot district on average exported 1,590,681.72 kg NTFPs worth NRs. 3,819,271.6 (equivalent to USD 32,081.88) from the year 2015 to 2020 to the national economy through royalty. NRs. 2,246,719.4 (equivalent to USD 18,872.44) per year came from MAPs and NRs. 1,572,552.2 (equivalent to USD 13,209.4) from resin during the years 2015 to 2020. If this district could produce all the commonly available NTFPs in a large scale, then there would be a high possibility of transforming the current unviable economy into a practical and vibrant economy. A proper inventory, identification and sustainable harvesting, are essential to promote and conserve these NTFPs.

Keywords

Karnali province; MAPs; NTFPs; Resin; Sustainable harvesting



Introduction

Nepal is rich in biodiversity, both flora and fauna, at the ecosystem, species, and genetic level. Nepal ranks 10th in terms of the richest flowering plant diversity in Asia and 31st in the world (Bhujju *et al.*, 2007). Nepal harbours 3.2% of the world's total flora, i.e., 11,971 species (GoN/MoFSC, 2014), but its diverse topographic and climatic variations ranging from tropical to the alpine tundra of high altitude Himalayas offer a variety of high-value non-timber forest products (NTFPs) throughout the country. Government of Nepal has categorized NTFPs into eight different categories: fruits and seeds (65), roots and rhizomes (48), leaves/stems (30), barks (25), whole plants (21), flower and fur (hair) (16), gum, resin and lac (8), and others (24), especially for collecting royalty (GoN/MoFSC, 1995). 12 species are prioritized for commercial cultivation and market promotion (Shrestha and Das, 2008 cited in Kunwar, Ansari, and Luintel, 2009).

NTFPs are all forest products other than timber and firewood such as leaves, shoots, juice, barks, flowers, cotton, tannin, gum, resin, fruits, seeds, and roots (Ahenkan and Boon, 2010). The main habitat of NTFPs is forest land. NTFPs are increasingly growing popular with national and international markets as they are important ingredients of several herbal cosmetics, herbal tea, food, medicines, etc. (Banjade and Paudel, 2008). The use and development of NTFPs is identified as one with the most important possible solutions to sustainable management of forests and uplifting the local economy (Wiersum and Ros-Tonen, 2005; Mukul *et al.*, 2010; Kar and Jacobson, 2012). They have the potential for livelihood support, poverty alleviation, biodiversity conservation, and economic growth of rural communities worldwide (Angelsen *et al.*, 2014; Shackleton and Pullanikkatil, 2018; Reta, Girum and Mekonnen, 2020). NTFPs are subsistence as well as the main source of income; they have cultural and ritual values in traditional forest communities (Angelsen and Wunder, 2003; Sahoo *et al.*, 2020).

There are more than 700 plant species that have medicinal value, of which 238 are in active use and 100 are in trade (Shrestha, Shrestha, and Shah, 2020). Trading of NTFPs started with the harvesting of lichen in the 1980s and other NTFPs have been rapidly identified and commercialized thereafter (Bista and Webb, 2006). A 1995 survey of producers, traders, and processors of NTFPs operating from the eastern border of the country to the mid-western town of Nepalgunj showed that a total of 100 entrepreneurs handled 42,000 tons of over 100 different NTFP items, equal to USD 26 million (Subedi, 1997). It was found that about 90% of total NTFPs exported to India annually from Nepal (Edwards, 1996).

Various studies show that the NTFPs sub-sector in Nepal contributes 5% of national GDP out of the 15% contribution from the forestry sector (Pyakurel and Baniya, 2011). Nepal is estimated to export around 33,000 metric tons of medicinal and aromatic plants (MAPs) products with an annual revenue amounting around USD 19-60 million (MoFSC, 2009). The export value increased from USD 27.49 million in 2005 to USD 60.09 million in 2014. Nepal on average exported 13,230 metric tons MAPs products worth USD 39.34 million per year (Kalauni and Joshi, 2018) to more than 50 countries. Over 90% of the NTFPs are traded to India in crude forms without value adding processes, which provide lesser benefits to the local and national economy (ANSAB and EWW, 2000). Nepal, however, lacks the technical, financial, and guaranteed market capabilities for processed NTFPs. ANSAB (Asia Network for Sustainable Agriculture and Bioresources) has reported that around 189,000 people work in the NTFPs sub-sector (MSFP, 2014), drawing between 15 and 50% of their household income (Karki and Bhattarai, 2012; MSFP, 2014).

In Nepal, the growing middle class and lifestyle changes also impact the trade in and prospects of NTFPs. Analysis of the royalty contribution of various forest products during the fiscal year 2015-16 illustrates that royalty from forest products estimated NRs. 930,606,243.39 (equivalent to USD 7,817,092.44). About 70% of the royalty was from only timber and only 6.56% was from NTFPs. The remaining 22% was from the royalty paid by community forest and private forests. Among NTFPs, the contribution of medicinal plants was only 3% (DOF, 2017). A large number of people, mainly in the hilly regions of western Nepal, are engage in collection of MAPs for their livelihood. About 215 Plant species are used for the treatment of 139 types of diseases by major ethnic groups in hilly districts of Nepal (Miya, Timilsina and Chhetri, 2020).

Herbs are highly used for traditional medicine followed by trees, shrubs, climbers, and grasses (Kandel *et al.*, 2020). Therefore, if NTFPs are promoted well, this sector can contribute immensely to uplifting the socio-economic status of local people.

Different laws, regulations, plans, and policies formulated by the Government of Nepal have also encouraged the development NTFPs sector. However, implementation of those plans and policies have not been effective (Schippmann, Leaman and Cunningham, 2006). A proper investment in NTFPs can create employment opportunities for local people reducing the youth migration to cities and foreign countries for jobs (Karki and Bhattarai, 2012). Thousands of rural people are involved in NTFPs collection and enterprises in different regions of the country. However, very little study has been conducted about contribution of NTFPs to the local and national economy. As far as Jajarkot district is considered, Manandhar (1995) has documented 60 medicinal plants with their local uses. The present study aims to explore traded NTFPs from the district and their contribution to the economy. The study will help to identify and prioritize potential NTFPs for uplifting local economy in the district.

Study Area

Geographically, Jajarkot is a higher mountainous district located in the Karnali Province of Nepal. It lies on 28 37' 22" N to 29 06' 22" N latitude and 81 49' 22" E to 82 34' 86" E longitude with elevation ranging from 610 m to 5,412 m from the sea level. Naturally, the Jajarkot district is divided into three zones: i). high mountain, ii). mountain, and iii). riverine flat land. Out of the total area of 2,230 km², the maximum area is covered with forestland (55.9%), followed by agricultural land (15.8%), rangeland (11.8%), shrubland (11.7%), and other lands (4.8%). According to DFO/Jajarkot (2020), the forest of Jajarkot can be divided into the following types (based on climate):

- a) Sub-tropical (1,000 m to 1,500 m): Major tree species are *Shorea robusta* (Sal), *Pinus roxburghii* (Khote Sallo), *Terminalia tomentosa* (Asna), *Adina cordifolia* (Karma), *Toona ciliata* (Tooni), *Alnus nepalensis* (Uttis), *Acacia catechu* (Khaer), and major NTFP species are *Zanthoxylum armatum* (Timur), *Swertia chirayita* (Chiraito), *Terminalia chebula* (Harro), *Terminalia bellirica* (Barro), *Phyllanthus emblica* (Amala), *Bergenia ciliata* (Pakhanbed), *Urtica dioica* (Sisnoo), *Persea spp.* (Kaulo), *Sapindus mukorossi* (Rittha), *Cinnamomum tamala* (Tejpat), etc.
- b) Temperate (1,500 m to 2,500 m) : Major tree species are *Pinus wallichiana* (Gobre Salla), *Quercus leucotrichophora* (Banjh), *Quercus semicordata* (Khasru), *Tsuga dumosa* (Thingure Salla), *Taxus baccata* (Lauth Salla), and NTFP species are *Valeriana jatamansi* (Sugandawal), *Nardostachys grandiflora* (Jatamansi), *Allium wallichii* (Banlasun), *Paris polyphylla* (Satuwa), *Ipomea spp.* (Kala dana), *Lycopodium spp.* (Jhyau), etc.
- c) Alpine forest (above 2,500 m): Major tree species are *Pinus wallichiana* (Gobre salla), *Tsuga dumosa* (Thingure Salla), *Rhododendron arboreum* (Laliguras), *Betula utilis* (Bhojpatra) and *Cedrus deodara* (Debdar), etc.

Methodology

Online portals like Google Scholar and ResearchGate were primarily used to collect data (Gautam *et al.*, 2020). The data regarding the quantity of the MAPs collection and revenue generation from the forest of Jajarkot district was retrieved from the documents obtained from the Division Forest Office, Jajarkot. Project reports, annual reports of government of different dates were also cited to collect more information on medicinal and aromatic plants of Nepal. Collected data from various sources were analyzed and represented in tables and graphs with the help of Microsoft Excel.

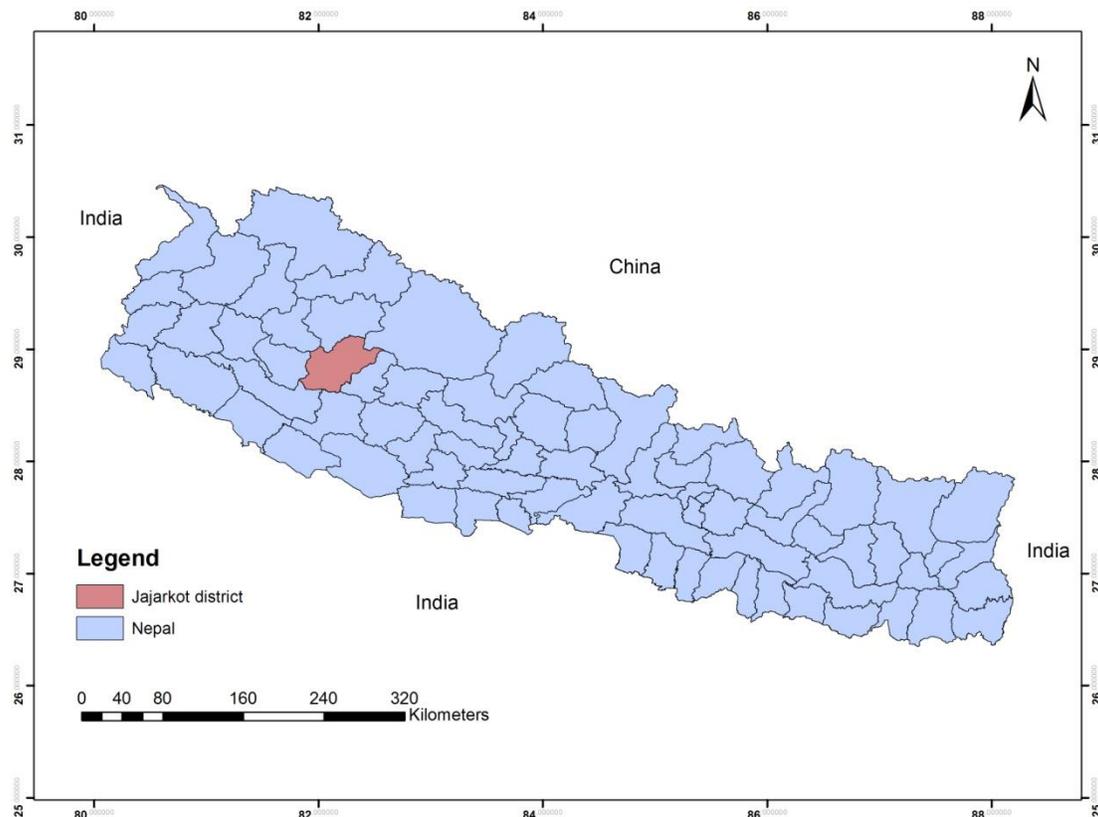


Figure 1: Map of Study Area showing Jajarkot district, Nepal

Results and Discussion

NTFPs in Jajarkot district

From the analysis it was reported that a total of 53 types of NTFP species were traded from Jajarkot district (DFO/Jajarkot, 2020). These NTFPs belong to 42 families, of which Lauraceae family represent the maximum numbers of species. Alliaceae, Asparagaceae, Asteraceae, Combretaceae, Rutaceae and Urticaceae families represent two species each, while the rest of the families represent only one species each. Two NTFPs were animal products (local name: Maha and Main) and one is a mineral extract (Silajit) (Table 1).

Table 1: List of NTFPs that are traded from Jajarkot district

S.N.	Local Name	Scientific Name	Common Name	Family
1.	Allo	<i>Girardinia diversifolia</i>	Himalayan Nettle	Urticaceae
2.	Amala	<i>Phyllanthus emblica</i>	Indian Gooseberry	Phyllanthaceae
3.	Attis	<i>Aconitum heterophyllum</i>	Indian Ateesh	Ranunculaceae
4.	Ban Lasun	<i>Allium wallichii</i>	Himalayan Onion	Alliaceae
5.	Ban Pyaj	<i>Allium spp.</i>	Wild Onion	Alliaceae
6.	Barro	<i>Termanalia bellerica</i>	Bedda Nut	Combretaceae
7.	Bel	<i>Aegle marmelos</i>	Stone Apple	Rutaceae
8.	Bhojpatra	<i>Betula utilis</i>	Himalayan Birch	Betulaceae
9.	Bhringraj	<i>Eclipta prostate</i>	False Daisy	Asteraceae
10.	Bhutkesh	<i>Selinum tenuifolium</i>	Fern-leaf Milk Parsley	Apiaceae
11.	Bishphej	<i>Polypodium vulgare</i>	Wall Fern	Polypodiaceae
12.	Bojo	<i>Acorus calamus</i>	Sweet Flag	Acoraceae

S.N.	Local Name	Scientific Name	Common Name	Family
13.	Chiraito	<i>Swertia chirayita</i>	Chiraito	Gentianaceae
14.	Chiuri	<i>Diploknema butyracea</i>	Indian Butter Tree	Sapotaceae
15.	Chutro	<i>Berberis spp.</i>	Indian Berberry	Berberidaceae
16.	Dhatelo	<i>Prinsepia utilis</i>	Himalayan Cherry Prinsepia	Rosaceae
17.	Dhupi	<i>Juniperus spp.</i>	Juniper	Cupressaceae
18.	Gucchi Chyau	<i>Morchella spp.</i>	Morel	Morchellaceae
19.	Gurjo	<i>Tinospora sinensis</i>	Chinese Tinospora	Menispermaceae
20.	Gurmar	<i>Gymnema sylvestre</i>	Gurmar	Apocynaceae
21.	Harro	<i>Terminalia chebula</i>	Chebulic Myrobalan	Combretaceae
22.	Jatamansi	<i>Nardostachys grandiflora</i>	Spikenard	Caprifoliaceae
23.	Jhyau	<i>Lycopodium spp.</i>	Lichen	Lycopodiaceae
24.	Kachur	<i>Curcuma zedoaria</i>	Zedoary	Zingiberaceae
25.	Kakarsinghi	<i>Pistacia integerrima</i>	Kakkar	Anacardiaceae
26.	Kala Dana	<i>Ipomea spp.</i>	Morning Glory	Convolvulaceae
27.	Kalikath	<i>Myrsine semiserrata</i>	Blueberry Myrtle	Myrsinaceae
28.	Kamraj	<i>Helminthostachys zeylanica</i>	Flowering Fern	Ophioglossaceae
29.	Kaulo	<i>Persea spp.</i>	Fragrant Bay Tree	Lauraceae
30.	Khote Salla	<i>Pinus roxburghii</i>	Chir Pine	Pinaceae
31.	Kurilo	<i>Asparagus spp.</i>	Asparagus	Asparagaceae
32.	Kutki	<i>Picrorhiza kurroa</i>	Kutki	Pentaginaceae
33.	Loktha	<i>Daphne bholua</i>	Nepali Paper Plant	Thymelaeaceae
34.	Maha	-	Bee Honey	-
35.	Main	-	Bee Wax	-
36.	Majitho	<i>Rubia manjith</i>	Indian Madder	Rubiaceae
37.	Panchaule	<i>Dactylorhiza hatagirea</i>	Marsh Orchid	Orchidaceae
38.	Padamchal	<i>Rheum austral</i>	Himalayan Rhubarb	Polygonaceae
39.	Pakhanbed	<i>Bergenia ciliate</i>	Hair Bergenia	Saxifragaceae
40.	Pani Amala	<i>Nephrolepis Cordifolia</i>	Fishbone Fern	Nephrolepidaceae
41.	Rato Chyau	<i>Ganoderma lucidum</i>	Reishi Mushroom	Ganodermataceae
42.	Rittha	<i>Sapindus mukorossi</i>	Chinese Soapberry	Sapindaceae
43.	Sajiwan	<i>Jatropha curcus</i>	Physic Nut	Euphorbiaceae
44.	Satuwa	<i>Paris polyphylla</i>	Himalayan Paris	Melanthiaceae
45.	Setakchini	<i>Polygonatum spp.</i>	Solomon's Seal	Asparagaceae
46.	Silajit	<i>Asphaltum</i>	Mineral Pitch	-
47.	Sisnu	<i>Urtica dioica</i>	Stinging Nettle	Urticaceae
48.	Somalata	<i>Ephedra gerardiana</i>	Gerard Joint Fir	Ephedraceae
49.	Sugandhakokila	<i>Cinnamomum glaucescens</i>	Cinnamon Berry	Lauraceae
50.	Sugandawal	<i>Valeriana jatamansi</i>	Indian Valerian	Valerianaceae
51.	Tejpat	<i>Cinnamomum tamala</i>	Indian Bay Leaf	Lauraceae
52.	Timur	<i>Zanthoxylum armatum</i>	Prickly Ash	Rutaceae
53.	Titepate	<i>Artemisia vulgaris</i>	Common Mugwort	Asteraceae

Source: DFO/Jajarkot (2020)

Trading Scenario of NTFPs

In the fiscal year 2019-20, a total of 444,665 kg of MAPs was traded contributing a total of NRs. 3,620,500 (equivalent to USD 30,412) royalty to nation economy. Comparing the revenue of fiscal year 2019-20 with total revenue collected from MAPs in the fiscal year 2016-17 in the country (NRs. 32,914,092.40), it shows

that Jajarkot district covers about 11% of total revenue collected from MAPs all over Nepal (DOF, 2017). Among different MAPs, the maximum traded species was Timur (*Zanthoxylum armatum*) that covered 28% of total traded MAPs. Whereas Setakchini (*Polygonatum spp.*) was the second most traded species (13%) and Pasanbed (*Bergenia ciliata*) was the third most traded species (11%) (Figure 2).

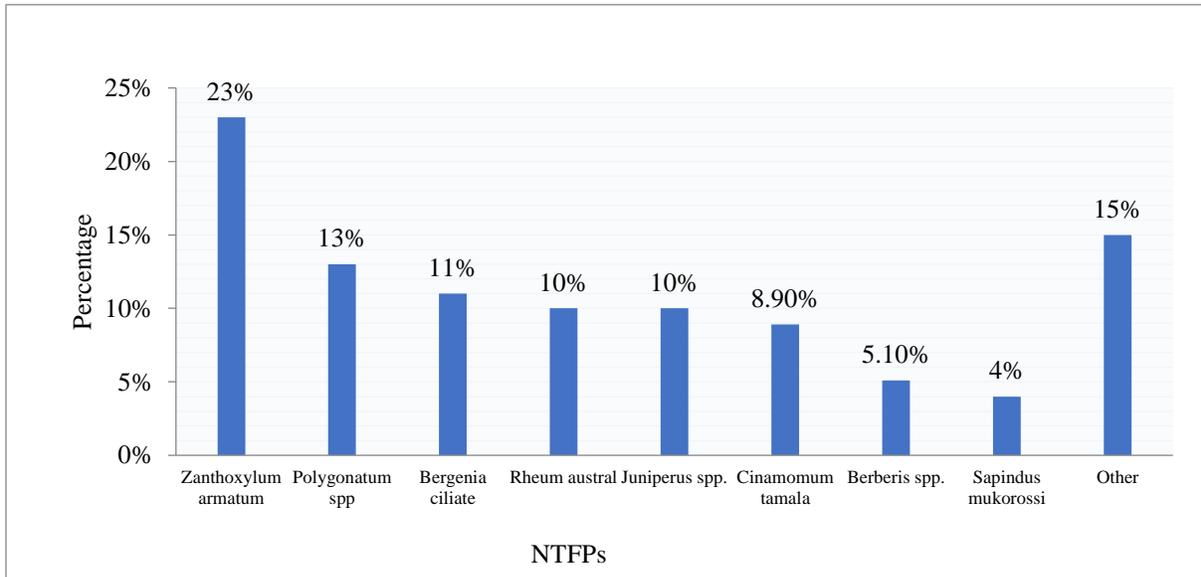


Figure 2: Percentage of the traded species in fiscal year 2019-20

Figure 3 shows the trade scenario of three most exported NTFPs i.e., Timur, Setakchini and Pasanbed from fiscal year 2015-16 to 2019-20. From this figure, we can conclude that the trade pattern of these NTFP species is increasing. For the sustainable management of these NTFPs, sustainable harvesting is required.

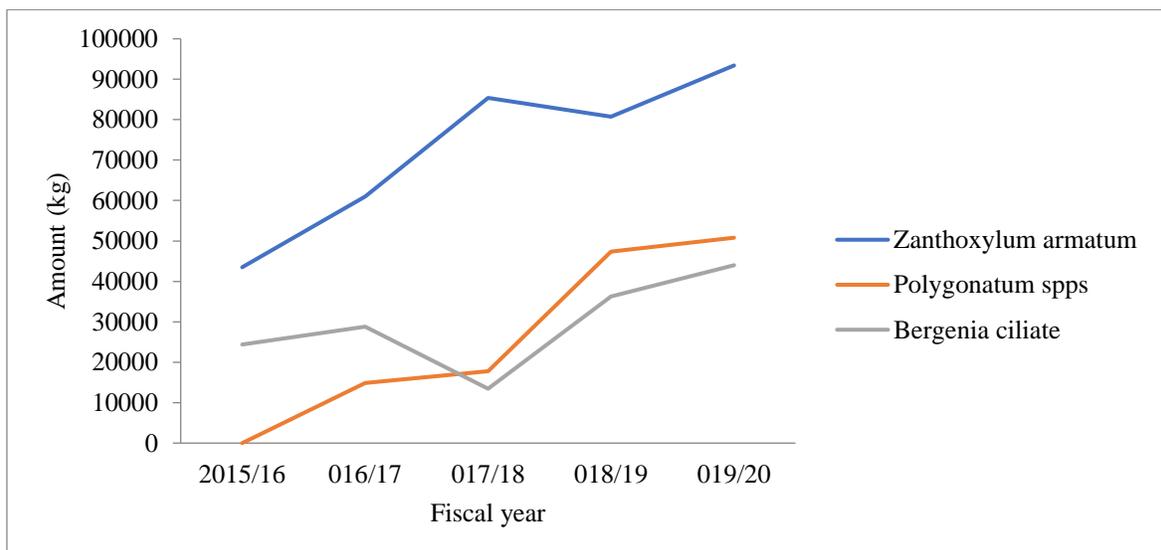


Figure 3: Traded pattern of three most exported MAPs.

Trading Rate of NTFPs (MAPs)

In the fiscal year 2015-16, the amount of the NTFPs collected from national forests was 94,029 kg which provided revenue of NRs.1,463,981 (equivalent to USD 12,297.44) to the government. While in the year,

2019-20, the amount of collection increased to 444,665 kg and revenue generated was NRs. 3,620,500 (equivalent to USD 30,412.2) (Figure 4 and Figure 5). From this, we can conclude that the trading rate of NTFPs per year from Jajarkot is increasing. Increased rate of harvesting and trading may lead to loss of such valuable NTFPs in the area. NTFPs could be threatened due to unsustainable harvesting, habitat loss, deforestation, over-grazing, and lack of marketing (Upriety *et al.*, 2010; Upriety *et al.*, 2016). So, it is important to explore the distribution pattern of NTFPs in the district, harvest and trade valuable NTFPs sustainably, launch effective strategies and programs for the conservation, identification and sustainable use of NTFPs. Upriety *et al.* (2016) have suggested an integrated approach to promote sustainable use of NTFPs along with contribution to livelihood improvement and income generation for local people.

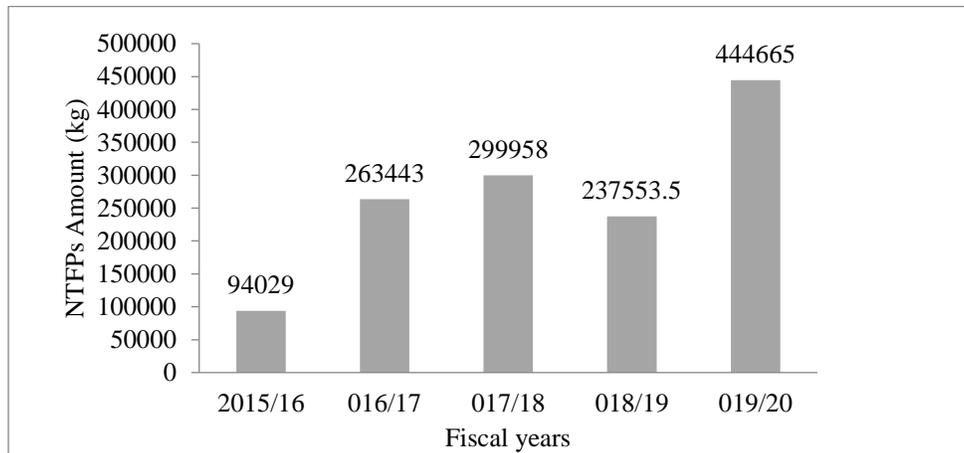


Figure 4: Trading rate of MAPs from Jajarkot

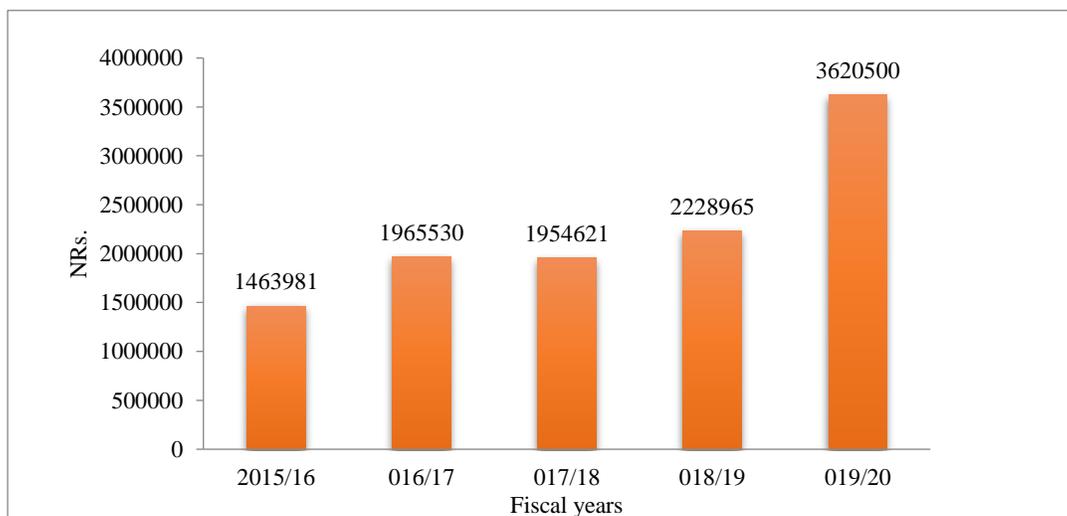


Figure 5: Royalty from MAPs from 2015-16 to 2019-20

Harvesting and Trading of Resin

During the fiscal year 2015-16 to 2019-20, a total of 1,322,752 kg resin was collected per year from community forests. It means that at least 293,945 trees have been tapped per year. A single Chirpine tree yields approximately 4.5 kg of resin annually (MSFP, 2007). It has also enhanced employment opportunities for local people, especially for poor and excluded groups. The amount of resin extraction is decreasing year by year (Figure 6). The reason behind decreasing the extraction of resin is the decreasing market value of rosin and turpentine in the Indian market.

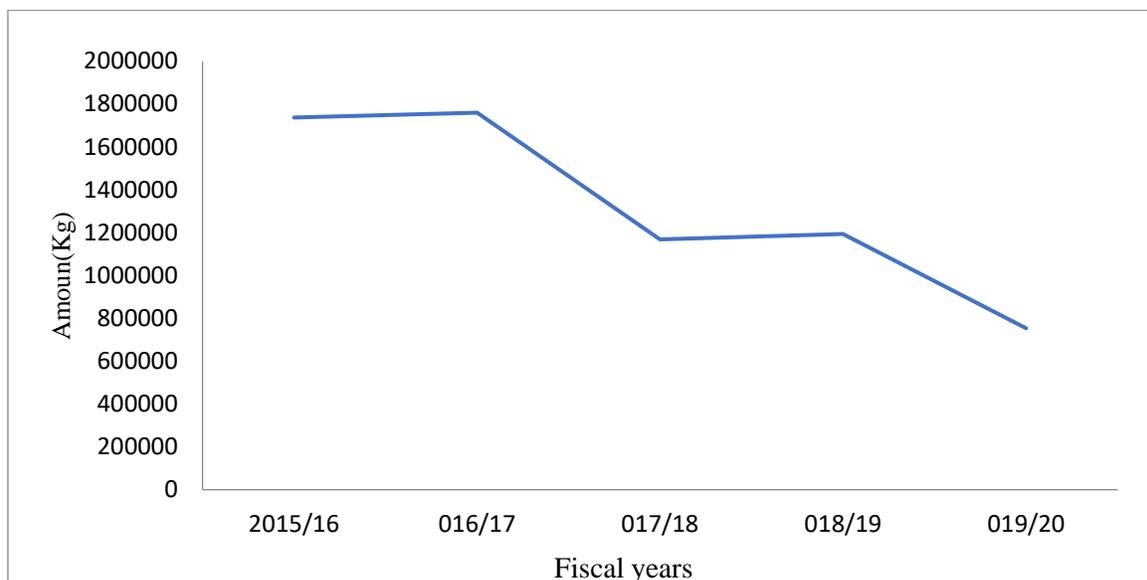


Figure 6: Harvesting pattern of Resin during fiscal year 2015-16 to 2019-20

In this district, eight resin companies are involved in Chirpine resin extraction from more than 100 community forests (DFO/Jajarkot, 2020). In the fiscal year 2019-20, a total of 753,615.6 kg resin was collected from community forests that generated NRs. 9,043,387.1 (equivalent to USD 75,964.45) to community forest user groups (CFUGs) and NRs. 1,175,640.323 (equivalent to USD 9875.4) royalty to the government. By analyzing data of last five fiscal year (2015-16 to 2019-20), it is discovered that average NRs. 12,096,555.5 (equivalent to USD 101,611.06) revenue was created to community forest user groups per year and NRs. 1,572,552.2 (equivalent to USD 13,209.44) per year to the Government of Nepal from the resin (Table 2).

Table 2: Revenue collected from resin since fiscal year 2015-16 to 2019-20

S.N.	Fiscal year	Revenue to CFUGs (NRs.)	Revenue to Government (NRs.)
1.	2015-16	13,902,838	1,807,368.94
2.	2016-17	14,079,170.40	1,830,292.15
3.	2017-18	9,352,758.40	1,215,858.59
4.	2018-19	14,104,623.60	1,833,601.07
5.	2019-20	9,043,387.10	1,175,640.32
	Average	12,096,555.50	1,572,552.20

(CFUG= community forest user group)

Conclusion

Jajarkot district, on an average, exported 1,590,681.72 kg NTFPs worth NRs. 3,819,271.6 (equivalent to USD 32,081.88) to nation economy per year, whereas NRs. 2,246,719.4 (equivalent to USD 18,872.44) per year came from only MAPs and NRs. 1,572,552.2 (equivalent to USD 13,209.4) from resin. *Zanthoxylum armatum* (Timur), *Polygonatum* spp. (Setak chini), *Bergenia ciliata* (Pasanbed), *Sapindus mukorossi* (Rittha), *Phyllanthus emblica* (Amala), *Cinnamomum tamala* (Dalchini), *Polypodium vulgare* (Bisphej) and resin of *Pinus roxburghi* (Chirpine) were the most traded NTFPs from Jajarkot. These NTFPs are valuable in terms of medicinal use and essential oils extraction. NTFPs collection and trade are providing the employment opportunity to the people to uplift their income. Due to lack of proper knowledge about NTFPs, unscientific collection, and illegal trading of NTFPs, many species of NTFPs are being in danger of

extinction. Creating a proper inventory and developing their sustainable harvesting protocol are the current need for conserving and sustaining these highly valuable NTFP species.

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Authors' Declarations and Essential Ethical Compliances

Authors' Contributions (in accordance with ICMJE criteria for authorship)

Contribution	Author 1	Author 2	Author 3	Author 4	Author 5
Conceived and designed the research or analysis	Yes	Yes	No	Yes	No
Collected the data	Yes	Yes	No	No	Yes
Contributed to data analysis & interpretation	Yes	Yes	No	Yes	Yes
Wrote the article/paper	Yes	Yes	Yes	Yes	Yes
Critical revision of the article/paper	Yes	Yes	Yes	No	Yes
Editing of the article/paper	Yes	No	Yes	No	No
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The research did not involve plants or animal species. No

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