Journal of Plant Resources Special Issue (2022) **20**(2), 235-245
https://doi.org/10.3126/bdpr.v20i2.57042

Medicinal and Aromatic Plants of Makawanpur District, Central Nepal: Trade Scenario, Issues and Challenges

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Abstract

Medicinal and aromatic plants (MAPs) are one of the most important components of non-timber forest products. This study aims to assess the collection, cultivation and harvesting, processing and trade scenario in Makawanpur district. Information gathered from the field visit to the study area, focus group discussion, key informant interviews and relevant literature were analyzed. In addition to the multiple subsistence uses of MAPs, some 30 species were also having trade value. Major MAPs species were collected from the wild whereas a few species like *Asparagus*, *Cinnamomum*, *Myrsine,* etc. were practiced for cultivation. Most of the MAPs were traded mainly to the Indian market without or just following a simple value addition. Except for *Taxus* and *Berberis*, none of the species was used for processing at the commercial level. The trade scenario showed a decreasing trend in both volume and value in the last few years. The unpredictable fluctuation in the market price of the products, the trader-controlled market and quality of the product, the weak bargaining power of the producer and disease and pest were found to be the major challenges faced by the local farmers.

Keywords: MAPs cultivation, NTFPs, Production, Trade status, Value addition

Introduction

Human beings are known to use natural resources in different ways since time immemorial (Kunwar & Bussmann, 2009) indicating the existing close relationship between plants and people either in abstract or concrete form. They largely depend on plant resources which provide a wide range of useful goods and services broadly categorized into timber and non-timber forest products. Non-timber forest products (NTFPs) consist of goods of biological origin other than timber derived from forests, other wooded lands and trees outside forests (Food and Agriculture Organization of the United Nations [FAO], 1999). Medicinal and Aromatic Plants (MAPs) are one of the most important and biggest components of NTFPs which provide a remarkable contribution to the rural economy and healthcare services (Pyakurel & Baniya, 2011).

The unique position of Nepal in the center of the Himalayas with diverse microclimatic conditions enables it to host thousands of plant species having medicinal and aromatic properties. It has been estimated that there exist up to 2331 useful medicinal and aromatic plants widely used for various medication systems in the Nepal Himalaya (Kunwar et al., 2022; Rokaya et al., 2012).These plants have not only provided medicinal value to mankind but also played a crucial role in household income, biodiversity maintenance and the market economy (Adhikari et al., 2019; Pyakurel et al., 2018). Moreover, Nepal has become one of the leading suppliers of MAPs mainly to India and China (Chapagain et al., 2021). People still depend on traditional and folk medicinal practices in the treatment of various common diseases such as dysentery, diarrhea, gastritis, jaundice, etc. (Bhattarai & Tamang, 2017; Dangol et al., 2017; Kunwar et al., 2013, 2022; Luitel et al., 2014).

Many people in the Himalayan region derive employment and income from the collection, cultivation, processing and trade of medicinal plants. MAPs, indeed, are an important tool for addressing the poverty issue by contributing to health care services, food security and income generation (Pyakurel et al., 2019). However, due to the increase

in demand, unorganized and haphazard methods of untimely collection led to the decline of the resources thus indicating an utmost requirement of cultivation on private land and adopting sustainable harvesting in their natural habitats to maintain sustainable production. This study aims to assess the collection, cultivation and harvesting practices, processing, and trade scenario of MAPs in Makawanpur district.

Materials and Methods

Study area

The present study was undertaken in the Makawanpur district of Bagmati province, central Nepal (Figure 1). It extends between 27.5546°N latitude and 85.0233°E longitude with an elevation range of 166m to 2586 m asl supporting a wide range of ecological diversity of tropical (up to 1000 m), sub-tropical (1000-2000 m) and temperate vegetation (2000-3000 m) (District Development Committee [DDC], 2015). Hatiya, Furkechaur, Chattiwan, Phabarbari, Raigaun, Chaughada, Makawanpur Gadhi, Thingan, Lothar, Manahari, Rajaiya, Handikhola, Basamadi, Bhimphedi, Simbhangyang, Daman, Palung, Markhu, Gogane were the major sites where the field study was focused in the local markets with the traders and farmers.The dominant ethnic community in the study area is Tamang, followed by Newar, Gurung, Chepang, Bankaria, etc. (Central Bureau of Statistics [CBS], 2011).

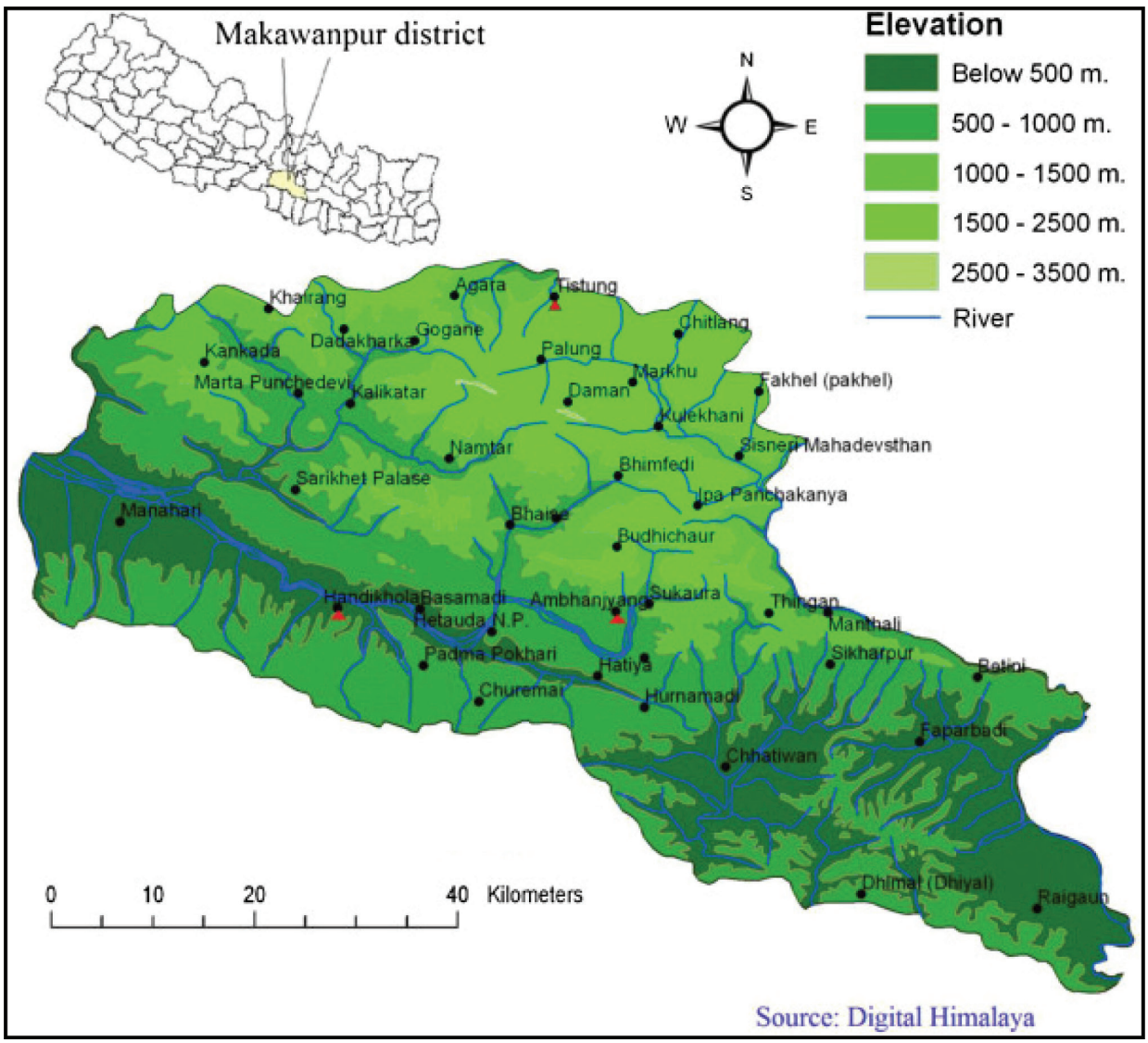

Figure 1: Map of Makawanpur district showing the study area

Data collection and analysis

A total of 15 field surveys were made to cover the major areas of the district from April 2021 to May 2021. During this period, information regarding the status of MAPs in the study area, cultivation and harvesting practices, processing and trade scenarios was explored. Likewise, a total of 10 focus group discussions were carried out with the locals who were involved in MAPs cultivation, collection, processing, and trade with prior informed consent. Along with this, a total of 27 key informants (local healers, cultivators, traders, and government officials) were consulted for the validation and verification of the information. The voucher specimens were identified using relevant literature like Suwal (1969), Malla et al. (1986), Stainton (1988), Press et al. (2000) and Chapagain et al. (2016) etc.

Results and Discussion

Trade status of MAPs

A total of 30 species were recorded being traded from the study area. These MAPs were commonly gathered by local communities in the district's remote rural villages and sold to road-head businessmen. The trade status of MAPs from the district (Table 1) showed that *Asparagus racemosus* be the species being traded on a large scale followed by *Myrsine*, *Paris*, *Polypodium*, *Oroxylum*, *Rubia*, *Machilus* and so on. Likewise, the volume of trade of a few species like *Tinospora, Piper, Daphne* etc. was found to decline at zero levels though they were among the common species of trade even up to the last few years back. This evidence indicated that there was continuous collection pressure on the natural population of these valuable species.

Table 1. Trade status of the MAPs from the study area

S.N.	Scientific name	Local name	Total volume of the MAPs (Kg) in the Fiscal Year					
			2013/014	2014/015	2015/016	2016/017	2017/018	2018/019
1	*Swertia chirayita* (Roxb. ex Fleming) Karsten	Chirayito	650	722	235	0	0	0
2	*Allium wallichii* Kunth	Banlasun	200	370	550	0	0	0
3	*Asparagus racemosus* Willd.	Kurilo	74,942	10,000	72,300	97,435	34,800	17,215
4	*Machilus odoratissimus* Nees	Kaulo	5,070	2,000	1,680	1,000	500	0
5	*Paris polyphylla* Sm.	Satuwa	7,100	75	18,260	0	0	0
6	*Oroxylum indicum* (L.) Kurz	Tatelo	2500	0	2,700	0	4,700	11,000
7	*Sapindus mukorossi* Gaertn.	Rittha	1,000	0	0	0	0	0
8	*Cinnamomum verum* J. Presl	Dalchini	500	1,000	70	0	0	0
9	*Cinnamomum tamala* (Buch.-Ham.) Nees & Eberm.	Tejpat	1,300	2,150	700	0	525	0
10	*Rubia manjith* Roxb.	Majitho	1,950	3,072	4,600	3,800	2,100	0
11	*Smilax aspera* L.	Setakchini	400	610	280	200	400	0
12	*Taraxacum officinale* F.H.Wigg.	Halhale	100	2,850	1,000	0	1,100	300
13	*Polypodium vulgare* L.	Bisphej	3,100	4,800	10,150	4,000	1,000	0
14	*Bergenia ciliata* (Haw.) Sternb.	Pasanved	200	100	500	0	300	0
15	*Viscum album* L.	Hadchur	-	5,000	1,500	2,000	1,000	-

S.N.	Scientific name	Local name	Total volume of the MAPs (Kg) in the Fiscal Year					
			2013/014	2014/015	2015/016	2016/017	2017/018	2018/019
16	*Terminalia chebula* Retz.	Harro	0	2,000	0	0	0	0
17	*Terminalia bellirica* (Gaertn.) Roxb.	Barro	0	3,500	0	0	0	0
18	*Myrsine semiserrata* Wall.	Kalikath	0	800	0	28,065	34,004	0
19	*Sinopodophyllum hexandrum* (Royle) T. S. Ying	Laghupatra	0	0	500	0	0	0
20	*Taxus wallichiana* var. *mairei* (Lemee & H. Lev.) L. K. Ru & N. Li	Louthsalla	0	0	4,000	0	0	0
21	*Drepanostachyum intermedium* (Munro) Keng. f.	Nigalo	0	0	7,000	0	0	0
22	*Pouzolzia rugulosa* (Wedd.) Acharya & Kravtsova	Dar	0	0	0	500	0	0
23	*Daphne bholua* Buch.-Ham. ex D. Don	Lokta	0	0	0	0	-	0
24	*Phyllanthus emblica* L.	Amala	0	0	0	0	275	0
25	*Tinospora sinensis* (Lour.) Merr.	Gurjo	0	0	0	0	-	0
26	*Allium* sp.	Ban pyaj	0	0	0	0	-	0
27	*Nephrolepis cordifolia* (L.) C. Presl	PaniAmala	0	0	0	0	2,000	0
28	*Embelia ribes* Burm. f.	Tigedikophul	0	0	0	0	1,000	0
29	*Piper longum* L.	Pipla	0	0	0	0	-	0
30	*Aconitum ferox* Wall. ex Ser.	Bikh	0	0	0	0	-	0
	Total amount (Kg)		**99,012**	**39,049**	**126,025**	**137,000**	**83,704**	**28,515**
	Total revenue (NPR)		**-**	**176,875**	**154,965**	**103,500**	**68,475**	**-**

Source - DFOM (2021)

More than 90% of these were exported to the Indian markets in crude form. A similar kind result was also reported by Olsen (2005), Maraseni et al. (2006); Pandit (2008) and Ghimire et al. (2016) though with the growing global market, transboundary trade of these valuable species is in practice (Chapagain et al., 2021; Pyakurel et al., 2019). Although MAPs have evolved as an important source of income for many rural communities in Nepal, the real benefit couldn't be gained by the local people due to the trade being focused only on the raw form rather than the product form.

In recent years, the marketing trend of MAPs in/from the study area showed a decreasing order in both volume and value. While analyzing the trade data, the trend line of the volume of traded MAPs in the last few years showed a continuous decreasing trend since the fiscal year 2016/017 (Figure 2) whereas the trendline of revenue collected through these trades showed a continuous decline since the last few fiscal years (Figure 3). This might be due to a reduction in the number of harvestable products in the wild due to unsustainable collection practices, high collection pressure on the natural population,immature

collection, a low regeneration rate, and a COVID pandemic to some extent.

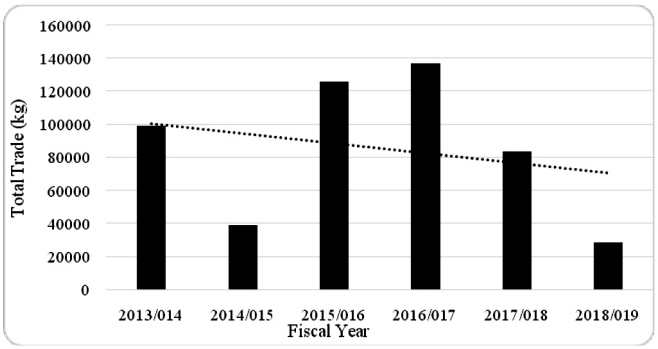

Figure 2: Total volume (in kg) of MAPs traded in the last few years

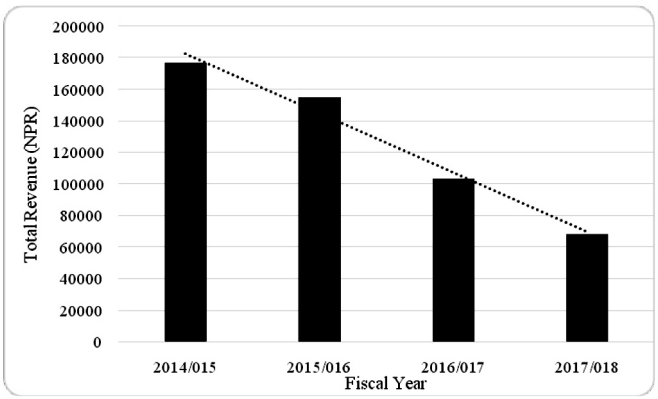

Figure 3: Total revenue collected through the trade of MAPs in the last few years

Indeed, the demand for MAPs has asreported by various researchers, increased in both national and international markets. For instance, Vasistha et al. (2016) have reported that some 3000 species of MAPs and their derivatives have been traded with the average value of global export being USD1.92 billion (601,357 tons per annum) in 2000, reaching USD 3.6 billion (702,813 tons) in 2014. Likewise, GIZ (2017) and The World Bank Group (2018) have also reported that the global medicinal plant export value has increased by 3% annually since 2010. In the Nepal Himalaya, Ghimire et al. (2016) reported that the annual value increased to USD 60 million in 2014 primarily due to an increase in price rather than an increment in volume.

Production of MAPs

Although *Asparagus racemosus* Willd. was practiced for massive cultivation in the private land, most of the species like *Myrsine semiserrata*, *Paris polyphylla*, *Polypodium vulgare*, *Oroxylum indicum*, *Rubia manjith*, *Machilus odoratissimus* etc. were collected from the wild. Besides *Asparagus racemosus* some other species viz. *Cinnamomum tamala* and *Rauvolfia serpentine* were also cultivated to some extent as intercropping systems mixed with other useful fruits and vegetable varieties. Forest Research and Training Center (FRTC, 2019) also reported a similar kind of result where the cultivation of *Zanthoxylum armatum* DC, *Juglans regia*, *Valeriana jatamansi* and *Swertia chirayita* along with *Rhododendron arboreum* and *Alnus nepalensis* in Dailekh and hilly part of Surkhet district and plantation of *Thysanolaena maxima* under *Cinnamomum tamala*, *Quercus leucotrichophora*, *Myrica esculenta* and *Choeirospondias axillaris* in Baitadi were notable examples of adoption of MAPs for intercropping systems.

Processing practices of MAPs

Despite a high possibility of existing MAPs contributing to socioeconomic status at the local and national level, most of these resources were being traded in raw form mainly to the Indian markets. Most of the MAPs provide ranges of chemical quality that can have a very high economic contribution but were traded at the same price irrespective of their quality (Bhattarai et al., 2018). Very few processing and extraction practices could be found in the study area. The extraction of Olive oil, *Gaultheria*, *Taxus* and *Berberis* were some of the noteworthy examples of processing practices. However, the extraction of *Gaultheria* was already stopped whereas the Olive oil extraction unit was also found to be closed. The intermittent flow of raw materials and high fluctuation of the market price of the product were the major cause of stoppage in both cases. Moreover, the information gap present at the local level regarding market demand, quality and sustainability issues, the implication of technology in value addition practices and poorly organized market channels has been observed as major challenges to the MAPs processing and marketing system in the study area.

Cross-cutting issues

Despite being a renewable natural resource, MAPs also require a certain period to grow and maintain maturity. If the resources are used beyond their natural regeneration, the population would be declined. The larger the market for the MAPs, the higher becomes its value and the greater the overexploitation. This necessitates a more careful assessment of MAPs resource base as well as devising a sustainable harvesting system to conserve the resources for long-term benefit (Ghimire, 2008). However, the increase in the demand for MAPs in both national and international markets has led to indiscriminate and unscientific collection in the study area. As a result, some five species had already decreased to zero level in the trade volume though they were traded enough even up to the last few years back.

As most of the MAPs were collected from wild sources and there was growing competition in the harvesting of MAPs thus the sustainability issue was always questionable. Still today local people in the study area use traditional methods to determine the timing of harvesting, material to be harvested, harvesting techniques, harvesting equipment, and even storage system and there was almost no use of advanced scientific tools and techniques adopted for gathering the valuable plant parts or as a whole. Likewise, the forest encroachment problem especially in the western part (Lothar) had also become one of the major challenges for the conservation of MAPs resources. Ghimire (2008) and Deb et al. (2015) also reported that most of the high-valued MAPs were long-lived perennial with slow growth and showed high habitat specificity, but the increasing commercialization of certain selected high-valued MAPs, premature and over-harvesting by uprooting or cutting of the whole plant were the serious concerns for the sustainability of such species.

The conservation and management aspect of MAPs in the study area was found to be challenged by multiple factors and sometimes the resources were also called the tragedy of the commons. Moreover, in many field observations, over-harvesting, the immature extraction of fruits, roots, tubers, unsustainable harvesting etc. was observed which had drastically reduced not only the quality and quantity of the raw product to below critical level but also created huge pressure on the natural regeneration. Along with these, habitat destruction, livestock grazing, forest fires, encroachment,etc. were also notable threats to the depletion of valuable species in their natural habitat.As a result, species like *Daphne bholua*, *Tinospora sinensis*, *Allium wallichii*, *Piper longum*, *Aconitum ferox,* etc. have decreased to zero level trade in the last few years though were traded enough in previous times.

The domestication of valuable MAPs in private farmland, community forest land and leasehold forest land can contribute a lot, but very little effort has been applied to the domestication of useful species. These resources are almost non-domesticated in Nepal and most traded MAPs are of wild origin collected from available sources (Pyakurel & Baniya, 2011). *Asparagus*, Olive, *Cinnamomum*, *Rauvolfia,* etc. were found to be flourished well in the private land or land in the lease in the study area, however, most of the respondents- farmers were disappointed due to various challenges they were facing. A similar kind of result was discussed by Sharma (2007), and reported that though the government had prioritized about 33 species for cultivation but still very little was known about the interest of local people to cultivate these valuable species in their cultivated land. This might be due to inadequate technical knowledge, facilities about cultivation and awareness along with the issues of equitable benefit sharing if cultivated in community forests. Besides, the uncontrolled fluctuation of market price was a major issue faced throughout the study period and a similar kind of result was discussed by Schippmann et al. (2006). Moreover, Dhital (2016) highlighted the government's complicated procedure regarding MAPs transactions, monopolistic market structure, no proper dissemination of technical knowledge and lack of onsite value addition process to be the major limiting factors for domestication. Even though many seasonal plants have a good market value, people were not getting much more benefits due to limited ideas of cultivation techniques and a gap in market information.

Very few active enterprises undertaking the processing of MAPs were found to exist in the study area. For instance, except *Taxus* and *Berberis* is processing centers at Basamadi, other processing centers were still adopting the traditional system of harvesting and adding value. MAPs collected from both wild and cultivated land in different areas were traded to the local trader and district trader without or just following a simple value-addition process.

Challenges to MAPs sector

Many studies have discussed the contribution of the collection and trade of MAPs to the local household income and livelihood in rural mountainous areas (Rayamajhi et al., 2012; Shrestha & Bawa, 2013), many studies, on the other hand, also reveal the challenges on management and conservation issues of these resources. Various anthropogenic activities like habitat degradation, overexploitation, increase global demand and price-rise have hindered the regeneration of these valuable species (Gauli & Hauser, 2011; Shrestha et al., 2014). Further, studies suggested that most of the MAPs are harvested from the wild which indeed, are considered common property resources thus the sustainability issue of harvesting was always questionable (Ghimire et al., 2016).

The complex government rules and regulation especially during release order, unpredictable fluctuation in the market price of the products, the trader-controlled market and weak bargaining power of the farmer was observed in the study area as a major hindrance to the trade of MAPs. The unpredictable fluctuation in the market price of the product was found as a common problem throughout the study area. For instance, the price of Asparagus in the fiscal year 2018/019 was up to 1200 NPR per Kg, however, the price got declined to 150-200 NPR in the fiscal year 2019/020. Moreover, the traders were not ready to buy these products even at this rate. As a result, farmers had not harvested the rhizome because this price was not sufficient enough even to pay the workers involved in harvesting and drying the rhizome. On the other hand, controlled market information, market monopoly and no alternative channel of trade also influenced benefit sharing among the locals (Smith-Hall & Helles, 2009).The inaccessible terrain was also another constraint which is why most of the forest-based micro and small enterprises in rural areas were only involved in the raw material collection and primary processing (Lamsal et al., 2017). Further, the forest collector communities who relied on MAPs for their livelihood were often poorly organized and sometimes they had to face great difficulties in selling the products even at local markets due to the overwhelming role of middlemen. Also, the price paid to gatherers for MAPs collection was often very low in comparison to the market price of the products. Similar to the findings of this study, Larsen and Smith-Hall (2007) also concluded that the Terai-based traders, the exporting central wholesalers, control the market information and capture a very large profit margin whereas village-based traders got benefited from the local collectors in the same way.

The processing of MAPs in the study area was still in the infant stage and followed mainly the traditional methods. For instance, *Diploknema butyracea*, a famous butter tree, was used to extract edible butter (ghee) using a traditional method in the western part (Lothar, Manahari) of the district. For this, a traditional grinder (Dhiki) was used to convert the seed into a fine powder and then placed on a perforated plate over the boiling pan and steamed before expelling the butter. However, with the use of advanced technology, the quantity is expected to increase from 25-30% to 40-45%. A similar finding was reported by Koirala (2009) in Rolpa district, western Nepal.

Conclusion

The role of MAPs is more crucial to the people living in the mountainous regions of the Himalayan countries as the people do not have any other suitable alternative for income generation. People harvest various forms of MAPs and either sell in local markets or use them in traditional ways. As the study area comprises altitudinal gradients ranging from tropical to temperate regions, the diversity of MAPs was obvious. Altogether 198 species having

medicinal and aromatic values were listed from the study area. Out of which, a total of 30 species were found being traded from the study area. These MAPs were commonly gathered from the wild by local communities in the remote rural villages of the district whereas a few species were also collected from the farmland. These were sold to road-head businessmen and nearly 90% of them were exported to the Indian market in the crude form. More than 80% of the total volume of the MAPs traded were harvested from the wild whereas the cultivation of a few selected species like *Asparagus*, *Cinnamomum*, *Rauvolfia,* etc. was also practiced. It was found that *Asparagus racemosus* was the species being traded on a large scale followed by *Myrsine*, *Paris*, *Polypodium*, *Oroxylum*, *Rubia*, *Machilus* and so on. Likewise, *Tinospora, Piper, Daphne* etc. got declined up to zero levels though these were traded in the previous time period.

Though the cultivation of *Asparagus* was found on a large scale in the study area, however, due to high market price fluctuation and information gaps people were discouraged from the cultivation of other MAPs. Thus, it is an urgent need to empower the existing traditional methods of utilization of economic MAPs, which have just been collected and traded in raw form, to create employment generation, involve youth, and strengthen the socio-economic condition of local people by implementing scientific tools and techniques at every level of collection, processing, and trade. Moreover, the implementation of a MAPs-focused policy to promote the cultivation of MAPs in an organized form, establish processing centers, and initiate trade MAPs at the product/ chemical level rather than in raw form are equally important to uplift the socio-economic status of the locals.

Author Contributions

S. Bhattarai and R. R. Parajuli designed the framework of the study. S. Bhattarai, R. R. Parajuli, R. G. Gautam and C. Thakur collected data from the field, literature and government officials. S. Bhattarai and R. G. Gautam wrote the manuscript.

Acknowledgments

The authors are thankful to all local people involved in the focus group discussion and fieldwork who had been practicing the collection, cultivation, processing and trade of medicinal and aromatic plants in the study area. Krishna bd. Bamjan, Dev Narayan Shrestha, Gopal Chaulagain, Bir Sing Lama, Govinda Aryal, Harisharan Aryal, Keshav Ratut, Dal bd. Rai, Saraswati Bhlon, Ram bd. Syantang, Jay bd. Syantang and many other known and unknown figures are highly acknowledged for sharing their valuable knowledge about cultivation, processing and trade-related issues. Likewise, they are also thankful to Mr. Achyut Lamichhane and the Divisional Forest Office, Hetauda for sharing the necessary information regarding the trade data of medicinal and aromatic plants in the study area. They are greatly thankful to Plant Research Center, Makawanpur for providing financial support for this work.

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