

# The Status and Role of Medicinal and Aromatic Plants (MAPs) in the Nepalese Livelihood

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## Abstract

Medicinal and aromatic plants (MAPs), a subcomponent of Non-Timber Forest Products (NTFPs), are one of the important sources which supply the rural population with cash income. Nepal's unique topography and varying climates have resulted in floral species count of 11,971, accounting for 3.2% of the world's total flora. Department of Plant Resources (DPR) reported an increase in medicinal plant species from 700 to 819, with 285 endemic plant species from 43 families and 238 plant species chemically tested for medicinal significance. MAPs can be found at elevations ranging from 100 to 5500 m. The highest MAPs species richness was reported in the middle gradient. Despite having low plant diversity, the commercial values of the NTFPs found in Nepal's mountains are the highest. The government of Nepal has prioritized 30 different MAP species for economic development, 12 species for cultivation and research, and imposed restrictions on the export of 12 species. Mid-Western and Far-Western development regions of Nepal account for more than 85% of total herbs collection in Nepal. About 80% of the population in Nepal depends upon MAPs for their primary health care needs. Around 100 Nepalese NTFPs are traded, but only 20 species account for 80% of the total trade in terms of volume and value. Nepal is ranked 42nd on the list, with \$7.4 million in MAP exports, and 62nd on the list, with \$3.3 million in essential oil exports. The overall contribution of NTFPs to national GDP was estimated to be 5%. In order to ensure food safety, reducing poverty, and improving livelihood, the promotion and domestication of NTFPs, proper harvesting mechanisms, and improved processing techniques are crucial.

## Introduction

Among many South Asian countries including Nepal, Ayurveda, a Hindu life science, remains the key source of medical knowledge and expertise (IUCN, 2004). Nepali Vaidhyas are thought to have had access to Ayurvedic knowledge as early as 879 A.D (IUCN, 2000). Medicinal plants are those plants having botanical components which have been proved or are known to be beneficial for one's well-being (The World Bank, 2018). Botanicals or herbal medicines are synonyms for medicinal plants. Plants that contain or exude volatile compounds like essential oils are known as aromatic plants (The World Bank, 2018). Medicinal and aromatic plants (MAPs), a subcomponent of Non-Timber Forest Products (NTFPs), are one of the major forestry resources which supply the rural population with cash income (Ruiz Pérez and Byron, 1999; Shackleton and Shackleton, 2004). MAPs have always been the most promising source of survival and economic opportunity for the rural people (Olsen and Larsen 2003). MAPs are extremely promising raw materials in the pharmaceutical, nutraceutical, and cosmeceutical industries (Marriott, 2000; Pieroni et al., 2004; Barnes and Prasain, 2005). Nepalese have useful experience and a convincing tale to talk about indigenous expertise, and long-practiced traditional uses of herbal medicine in the Himalayas (The World Bank, 2018). The majority of Nepalese people practice traditional medicine, which includes Ayurveda, Traditional Chinese medicine (TCM), Unani, and various types of indigenous medicine such as Tibetan Amchi (Shengji, 2001).

The country is ranked in the 25th position of global biodiversity richness and 11th among Asian countries (MoFE, 2018b). Nepal's unique topography and varying climates have resulted in floral species count of 11,971, accounting for 3.2% of the world's total flora (MoFSC, 2014). It has been estimated that there are

more than 7000 and about 4000 species of flowering and non-flowering plants in Nepal (MoFSC, 2014). According to the Medicinal and Aromatic Plants Database of Nepal (MAPDON), there are approximately 1,624 medicinal plant species in Nepal, with approximately 100 plants traded annually (SAWTEE, 2015). However, the Department of Plant Resources (DPR) reported an increase in medicinal plant species from 700 to 819 in Nepal (DPR, 2019). Till now, 238 MAPs species have been chemically tested for their medicinal properties (GoN, 2004). Nepal has 285 endemic plant species from 43 families, which has global biological significance (Rajbhandari and Dhungana, 2011). In Nepal, MAPs are more abundant in hilly and mountainous terrain, and their distribution is found in forests and grasslands above 2,000 m. (EPI, 2017). According to the most recent Forest Resource Assessment (2014), there are 329 and 666 NTFPs which are used for various purposes in the Terai and Siwalik regions, respectively (FAO, 2014). Mid-Western and Far-Western development regions of Nepal account for more than 85% of total herb collection in Nepal (GIZ, 2011). Far-west Nepal alone accounts for roughly 1/3rd of Nepal's total trade volume (Kunwar et al. 2015). About 143-161 NTFP species, including MAPs, are collected for commercial purposes (Bhattarai and Ghimire 2006; Subedi, 2006). In Nepal, however, 60 MAPs species are classified as endangered (Shrestha and Joshi, 1996; Bhattarai et al. 2002). Furthermore, approximately 50-60% of NWFPs harvests go unrecorded, as they are either consumed in households or sold in local markets without following any government procedures (FAO, 2014). Around 100 Nepalese NWFPs are traded, but only 20 species account for 80% of the total trade in terms of volume and value (FAO, 2014). NTFPs total contribution to national GDP was projected to be 5% (CECI, 2006). As buyers are becoming more interested in organic and natural goods, the market for MAPs continues to rise around the world (INCLUDE, 2014).

MAPs are among 19 sectors listed by the Nepal Trade Integration Strategy (NTIS) as having a high potential for trade promotion (NTIS, 2010). Since NTFPs have a shorter life span than timber (Lawrence, 2003), they are a result of comparative advantage from the forest because of their low volume high value compared to timber's high volume low value (Paudel & Acharya, 2018). Nepal's Non-timber forest product (NTFP) sector has been the subject of much debate and little action. One of the priority forestry programs in the Master Plan for Forestry Sector (1989-2010) was Medicinal and Aromatic Plants (MAPs) Whereas making it a priority initiative, the sector has not thrived as well as it should (FAO, 2014). Although MAPs are one of Nepal's government prioritized sectors in the Tenth Plan, it has not received adequate attention for the upliftment of poor rural people through the cultivation of MAPs (Bhattarai & Ghimire, 2016). This paper aims to provide a brief overview of MAPs' current ecological status, importance in human health and livelihood, and socioeconomic benefits to Nepalese.

## Methodology

This paper is based on a thorough analysis of online national and international publications, project papers, websites, booklets, government policy documents, and accessible published and unpublished materials. Google Scholar and Research Gate were the primary databases used for acquiring the literature including the keyword 'MAPs', 'NTFPs' 'Role', 'Livelihood', 'Covid-19', 'Export' and 'Nepal'. A total of 103 references from 1980 to 2020 were obtained and 60 references were selected on sorting closely related to the topic. The authors' perceptions about MAPs were also internalized into this article. Finally, the pieces of literature sorted were systematically reviewed multiple times and information about the status of MAPs and their role in Nepalese livelihood was gathered, compiled, arranged, and finally drafted in a present manuscript.

## Results and Discussion

### MAPs distribution in the context of Nepal

In Nepal, MAPs can be found at elevations ranging from 100 to 5500 m (Bhattarai and Ghimire, 2006). The highest MAPs species richness was found in the middle of the gradient. The MAPs of trees and climbers are found to be optimal at 1000 m; shrubs are optimal at 2000 m; and herbaceous are optimal at 2500 m (Bhattarai and Ghimire, 2006). In terms of distribution pattern of NTFPs, Nepal's tropical region (below 1,000 m) holds 49% of them, subtropical region (1,000-2,000 m) 54%, temperate region (2,000-3,000 m) 36%, sub-alpine region (3,000-4,000 m) 18%, and alpine region (above 4,000 m) holds 7% (Malla and Shakya,

1995). The following pie chart shows distribution according to different regions of Nepal.

Figure 1: Distribution of medicinal plants in different regions of Nepal

Source: (TEPC, 2018)

Figure 2: General trend of species diversity and commercial importance of NTFPs along the altitudinal gradient in Nepal

Source: (FAO, 2014)

Despite having low plant diversity, the commercial values of the NTFPs found in Nepal's mountains (highlands) are the highest. For example, the price of Kurilo (*Asparagus racemosus*) and Serpagandha (*Rauvolfia serpentina*) in the Terai regions is less than NRs. 500 per kilogram, whereas the price of Yarsagumba (*Cordyceps sinensis*), Wild Morel (*Morchella esculenta*), Jatamansi (*Nardostachys grandiflora*), Panchaule (*Dactylorhiza hatagirea*) etc. are many times higher than lowland species (FAO, 2014).

The Government of Nepal (GoN) has promulgated a Forest Policy, 2015 to minimize exploitation as well as to promote private sectors in the domestication and cultivation of MAPs in the natural environment. It has described 30 significant MAP species that will aid in the country's economic growth (GoN, 2010).

Table 1: List of MAPs species identified for economic development

Source: (GoN, 2010, DoPR, 2009; MoFSC, 2012)

Government of Nepal (GoN) has prioritized 12 different MAP species for cultivation and research (DoF, 2015).

Table 2: Price of NTFP/Medicinal and Aromatic Plants for cultivation and research

Source: (DoF, 2015)

Government of Nepal (GoN) has categorized 237 NTFPs in 8 groups for royalty collection under the Schedule-3 of the Forest Regulation 1995.

Table 3: Categories of NTFPs for collecting royalty

Source: MoFSC, 2012

The GoN has also imposed restrictions on the export of 12 NTFPs species under section 77 of the Forest Act 2019.

Table 4: MAPs species protected in Nepal

Source: DoF, 2018

The most exported MAPs essential oils and crude herbs overseas from Nepal according to recent data of Trade Export and Promotion Centre (TEPC) is given below:

Table 5: Most exported MAPs essential oils and crude herbs overseas from Nepal

Source: (TEPC, 2018)

Nepal Herbs and Herbal Products Association (NEHHPA) has prepared the identification manual of 69 commercial MAPs along with pictures. The Table 6 gives general description of species.

Table 6: List of some commercial MAPs of Nepal

Source: (Gurung & Pyakurel, 2017)

## Role of MAPs in Nepalese Livelihood

### Medicinal plants and Human Health

From the last three decades, the practice of herbal medicines has increased many folds and become mainstream treatment against diseases all over the globe especially in Asia (Kumar et al., 2015; Huang et al., 2020). Conventional medicinal practice is still prevalent and growing in popularity in developing countries. Health practitioners, the general public, and policymakers are grappling with questions about the protection, consistency, efficacy, preservation, and potential prospects of such herbal health care (TEPC, 2018). MAPs are used as raw materials in both traditional and modern medical systems. Currently, approximately 25% of allopathic drugs are derived from plant-related substances, with many more being synthetic analogs based on prototype compounds extracted from plant materials (Rao et al., 2004).

Traditional medicine, mostly plant medicines, is used for primary health care by 60% of the world's population and 80% of the population in developing countries (Shrestha & Dhillon, 2003). Traditional plant-based medicines are used by 70% of India's population (Gadgil, 1998), 80% of Pakistan's population (Ahmad & Ghafoor, 2000), and 80% of Nepal's population (Kunwar et al., 2006). For years, various pharmaceutical and cosmetic companies have used herbal plants as over-the-counter medicines as home remedies and therapies in developing countries, mostly in Asia (TEPC, 2018). In the absence of any proven medicines/vaccines for COVID-19 cure, possible antiviral and immune booster herbal medicines, extracts, and formulations may be useful in lowering the global mortality rate associated with COVID-19 (Srivastava et al., 2020). In the current situation, local people are using medicinal herbs as a treatment option for Covid-19 to boost immunity against viral attacks, as there is no specific treatment for COVID-19 available at this time. The medicinal herbs such as *Tinospora cordifolia* (Gurjo), *Glycyrrhiza glabra* (Jestimadhu), *Swertia chirayita* (Chiraito), *Ocimum sanctum* (Tulsi), *Zingiber officinale* (Aduwa), *Curcuma longa* (Haledo/Besar), *Allium sativum* (Lasun), *Withania somnifera* (Ashwagandha), *Moringa oleifera* (Sheetal Chini), *Zanthoxylum armatum* (Timur), *Cinnamomum zeylanicum* (Dalchini) and *Phyllanthus emblica* (Amala) are used in Nepal (Gyawali et al., 2020).

### Socio-economic Benefits

The GoN has designated the Karnali Zone as a "Pocket of Excellence" for the overall development of NTFPs, especially high-value medicinal plants (Poudel, 2015). The collection and cultivation of MAPs provide significant sources of revenue, improved livelihoods, and reduce poverty for rural households in high altitude communities. According to studies, 10 - 100% of households in Nepal's mountainous regions are interested in commercial MAPs collection (FNCCI-AEC/NEHHPA, 2012). MAPs can account for up to 50% of annual household income in hilly areas (FNCCI-AEC/NEHHPA, 2012). According to recent estimates up to 300,000 families are interested (directly/indirectly) in the collection of MAPs in 58 districts of Nepal, with an additional 100,000 ready to join the community if suitable conditions are established (SAWTEE, 2015). Women account for more than 50% of those involved in the collection, cleaning, and grading of MAPs (MoCS, 2010).

Medicinal and aromatic plants (MAPs) provide opportunities for Nepal to achieve long-term economic development. Nepal currently does not have a large-scale share of global MAPs markets, but MAPs are more important in Nepal's export basket than in other countries (The World Bank, 2018). Nepal, along with India and China, has been recognized as a major reservoir for the supply of MAPs in Asia (Pyakurel and Oli, 2013). According to a WHO study, herbal market demand nearly doubled in Asia during the late 1990s, and the total foreign trade in medicinal plants and their products was US\$ 60 billion in 2010 and is projected to cross US\$ 5 trillion by 2050 (WHO, 2002). The increase in export value over the last ten years (2005 to 2014) suggests increased global demand for MAPs (Ghimire et al., 2016). Nepal is ranked 42nd on the list, with MAP exports worth \$7.4 million (TEPC, 2018). Nepal exports 76% of its MAPs production to India and 2.5-3.5 %t to Vietnam, France, and China (Trademap, 2017). Only about 10% of the total quantity of MAPs obtained in Nepal is used to manufacture medicinal products or essential oils in factories and small manufacturing units (Tiwari et al., 2004). Nepal is ranked 62nd on the list, with \$3.3 million in essential oil exports (TEPC, 2018). Nepali essential oil is primarily exported to the United States (34%), followed by

Europe (37%), and then Asia (24%) (Trademap, 2017).

## Conclusion

In Nepal, the NTFPs sub-sector, especially MAPs, has enormous potential for improving the socio-economic status of local people and also increase national income and employment opportunities. The growing global demand for herbal products, owing to people's inherent interest and continuing belief in its effectiveness, has undoubtedly attracted Nepalese investors as well. Despite the vast potential of Nepal's MAPs for commercial promotion, only a few have been popularized. In Nepal, MAPs are largely unexplored and underutilized as a profitable and long-term market. Instead, haphazard and illicit wild harvesting and trade have overexploited some high-value natural herbs, causing several of these species to become vulnerable in Nepal. MAPs have been identified as one of the Himalayan region's potential high-value resources with tremendous economic growth potential, but the scale of poverty in the Himalayan region remains severe yet. As a result, the Nepalese government faces the challenge of transforming a poor region into a prosperous region through Sustainable harvesting of MAPs. Nepal will benefit the most from the rising international demand for MAPs, but there are a few fundamental issues that must be resolved before the sector can be formalized. To ensure food safety, reducing poverty, and improving livelihood, the promotion and domestication of NTFPs, proper harvesting mechanisms, and improved processing techniques are crucial.

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All the datasets used in the article are available through DOI <https://doi.org/10.5061/dryad.qz612jmgf>.

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