

Status of Medicinal and Aromatic Plant (MAPs) and Socio-Economic Influence in Nepalese Livelihood - A Review Research

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Abstract

Medicinal and Aromatic plants are grown from the time immemorial and possess high social, religious, cultural, and economical value in Nepalese community. Various parts of these annuals, biennials and perennial plants have been used as medicines, perfumes, and food. A total of 118 ecosystems are found in Nepal and 10,091 species of plants has been documented which include 5884 species of flowering plants. About 700 of the total plant species reported constitutes medicinal properties, of which 238 plants species have been chemically tested for their medicinal importance. More than 75% Nepalese people still depend on the herbal plants as a local source of medicine for their primary health care. Medicinal and Aromatic Plants (MAPs) contribute to the local and national economy and become the source of the cash for the rural livelihood at the hard time. The financial contribution made by Non-Timber Forest Products (NTFPs), especially medicinal plants, is significantly higher as compared to the timber products. There is shortage of raw materials, which mainly results from the lack of wholesale collection systems and due to lack of the raw material in the offseason. It is thus imperative to scale the MAPs cultivation to larger level through commercialization of the important medicinal and aromatic plant that are commonly available in the local community.

Keywords: Medicinal and Aromatic Plant (MAPs); Non-Timber Forest Products (NTFPs)

Introduction

Nepal is the treasure of the physiographical, biological and cultural diversity. Country consists of three distinct physiographic zones; Terai (plain lower belt), middle hills (Rocky Mountains) and upper Himalayas (high mountains with ice cover). Biological diversity thus becomes the beauty of such diverse geography. The country is located in the central part of main Himalayan range and is floristically characterized by the presence of six adjoining floristic regions, namely central Asiatic in the North, Sino-Japanese in the North East, South East Asia-Malaysian in the South East, Indian in the South Sudano-Zambian in the South-West and Irano-Turanean in the West [1]. The altitudinal variation ranges from about 60m to the top of the world (8,848m) and has made Nepal a rich country in plant bio-diversity. Nepal ranks the 31st richest country in the world in terms of biodiversity [2] with 118 ecosystems, 12 of 867 global terrestrial eco-regions and eight climatic zones (ranging from tropical to tundra) 35 forest types, and 75 vegetation units

[3]. At present, forest occupy 5828000 hectare of total land [4]. Although the country represents only 0.1% of the world's land area, it supports a comparatively high percentage of earth biodiversity. Nepal has 6,973 higher plant species and with 10% share on diversity of such valuable medicinal and aromatic plants [5]. Among the Asian countries for its floral wealth, Nepal ranked 10th with elevational distribution of 2,331 species of medicinal plants [2,6]. Various parts of these annuals, biennials and perennial plants have been used as medicines, perfumes, and food.

For the first time Pandey [7] reported 73 medicinal and aromatic plants (MAPs). Then after, Department of Medicinal Plants [8] reported 483 species; Malla and Shyaka (1984) reported 690 species of MAPs in Nepal. Manandhar (2002) has reported ethno-botanical information of 1,500 plant species, majority of them have medicinal value. Medicinal and Aromatic plants are termed as minor forest products before implementation of master plan for the forestry sector (1988), and were relatively neglected from the state. Later, due

to their high volume and commercial value are kept out of minor. They were recognized as important because of their diverse uses and high commercial value.

Collection and sales of valuable medicinal and aromatic plants helps to sustain livelihood of thousands of collectors and gatherers in hilly region. The sustainable collection of MAPs can provide valuable cash for rural people therefore government should focus to this sector for research and conservation to bring out it in to competitive world.

Global Scenario

It is estimated that 60% of the world’s population depends on traditional medicine for their primary health care needs. In developing countries, about 80% of the population is dependent upon such traditional medicinal practices [5,9,10]. Medicinal and aromatic plants are extensively used in Ayurveda, Traditional Chinese medicine system, Unani, and Sidhha. About 3000 species of the MAPs are traded internationally, among which 2000 of them are particularly traded in the European country like German, Switzerland and France [10]. Global import of the MAPs is raised by +3% since 2010 and reached in 2014 a volume of 673,564 tones that cost valued US\$ 2,724 million. The international market for MAPs is dominated by China, France, Germany, Italy, Japan, Spain, UK and the USA.

Country	Higher plants species	Medicinal plant species	Share
China	26,092	4,941	18.9%
India	15,000	3,000	20.0%
Indonesia	22,500	1,000	4.4%
Malaysia	15,500	1,200	7.7%
Nepal	6,973	700	10%
Pakistan	4,950	300	6.1%
Philippines	8,931	850	9.5%
Sri Lanka	3,314	550	16.6%
Thailand	11,625	1,800	15.5%
USA	21,641	2,564	11.8%

Table 1: Higher plant species and medicinal species in the Asia and the USA.

Source: Institute of Natural Medicines - Japan (2008).

Government Policy and Intervention in NTFP Sector

Medicinal and aromatic plants have been grown from the time immemorial and they have special religious, cultural and social

importance. Gradual effort of the government, private sector and other concerned stakeholders has brought many reforms in this realm. There are some of the important policies, strategies and key instruments formulated and implemented by Government of Nepal for the promotion of the NTFP.

Pioneering plan put forward by the government of Nepal for the prioritization and development of medicinal herb was National Forestry Plan (1976). It came up with various policy objectives among which one was to derive maximum economic gain from forest products by promoting the export of the medicinal herb. Later in 1989, Master Plan for Forestry Sector (MPFS) was put in place realizing the need for a long term plan for forestry sector which become a major document that stresses on developing non-timber forest products (NTFPs), including MAPs. This also guided the formulation of forest policies and incorporation of forestry-related issues in the country’s periodic five-year plans. In 2000, the Forestry Sector Policy was introduced with many long term plan and strategies. Among them one of the strategies was to identify, produce and process herbs and other NTFPs.

The tenth five-year plan (2002 - 2007), included the policies for the development and promotion of Medicinal and Aromatic Plants. One of the main programs identified for the forestry sector by the Tenth Plan five year plan was "Herbs and non-timber forest management program" which was purposed to achieve plant resource conservation management (Gene Bank), and development and extension of medicinal and aromatic plants processing technology.

Then after, three-year interim plan (2007 - 2010) came with the program for promoting herbs and non-wood forest product industry and marketing, giving priority to engage *Adibasi Janajatis* in such businesses with a vision to improve economic conditions of the people. This three year interim plan has identified medicinal herbs as one of the top priority commodities to promote in high hills stressing the formation of herbs processing cooperatives in the hills and high hills of the country. One of the strategies of the interim plan was to arrange the system of market mapping for value addition of herbs. This interim plan also supports the Herbs Production and Processing Company Limited to buy two machines as part of the herbs and aromatic oil processing program. The three-year plan approach paper (2010 - 2013) has also included some program for the development of Medicinal and Aromatic Plants. One of its working policies is to encourage program for production and processing of Medicinal and Aromatic Plants through public-community-private partnership and to prepare policy to develop special zones

for production and management of different species of Medicinal and Aromatic Plants.

In 2004, Nepal gains the membership of World Trade Organization (WTO). Medicinal and Aromatic Plants become one of those sector from which country could achieve relative comparative advantage due to enormous bio-diversity. In the same year, a separate policy on herbs and Non-timber Forest Product (NTFP) was realized since existing Forest Act and Rules did not have clear-cut provisions for the conservation and utilization of herbs and NTFPs. As a result the Herbs and NTFP Development Policy (HNDFP) was introduced in 2004 with the objective of bringing about socio-economic transformation of Nepal and Nepali people through the production and commercialization of herbs and Non-Timber Forest Products.

The long term vision of HNDFP is the conservation of herbs and NTFPs so as to contribute to the national economy, and hence introduce Nepal as a huge depository of herbs and NTFPs at the international level by 2020. This document encourage the commercial cultivation of valuable herbs and NTFPs; help in adding value to herbs and NTFPs through processing; help in accessing capital, developing infrastructure, acquiring technical knowledge and skills, and market management to make herbs and NTFPs commercially competitive. It encouraging both wild collection and cultivation of herbs, promote “Herbs Zones” establishment, networking among producers, collectors and traders for market management and finally development of infrastructure for processing of herbs and NTFPs. It also aims at simplifying certification and taxation processes related to herbs and NTFPs produced by the private sector through cultivation and has initiated the process of forest certification and organic certification.

Similarly, Trade Policy 2009 has identified herbs as one of the products having high export potential and has mentioned that herbs development program would be implemented for its commercialization and export enhancement [11].

The important associations in this subsector are Nepal Forest Industry Association, JadiButi Entrepreneurs Association of Nepal (JABAN), and Nepal Herbs and Herbal Products Association (NE-HHPA) [12].

“Plants of Nepal: Fact Sheet” a document prepared by the Department of Plant Resources (DPR) enlisted thirty species of the medicinal and aromatic plant that are prioritized for research and

development by the government. Further, it also has documented twelve species of MAPs that are prioritized for agro-technology development which are listed on the appendix 1.

S. No	Scientific Name
1.	<i>Asparagus racemosus</i> Wild
2.	<i>Cinnamomum glaucescens</i> (Nees) Hand.-Mazz
3.	<i>Dactylorhiza hatagirea</i> (D.Don) Soo
4.	<i>Nardostachys grandiflora</i> DC
5.	<i>Neopicrorhiza scrophulariiflora</i> (Pennell) Hong
6.	<i>Piper longum</i> Linn
7.	<i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz
8.	<i>Swertia chirayita</i> (Roxb. ex Fleming) Karsten
9.	<i>Taxus wallichiana</i> Zucc
10.	<i>Tinospora sinensis</i> (Lour.) Merr
11.	<i>Valeriana jatamansii</i> Jones
12.	<i>Zanthoxylum armatum</i> DC

Appendix 1

Table 1: Medicinal plants prioritized for agro-technology development. Source: (DPR, 2012) [1].

Government has been continuously formulating different laws and regulation to systemize the collection, cultivation and trade of the valuable medicinal and aromatic herbs. With the aim to preserve the bio-diversity and natural resources from depletion Government of Nepal (GoN) has conserved its botanical wealth through various acts and laws. Under *in-situ* conservation approach about 12 National Parks, 1 Wild-life Reserves, 1 Hunting Reserve, 6 Conservation Areas and 13 Buffer Zones are functional (DoF, 2017). Plants are also conserved, as a part of *ex-situ* conservation, in national level Botanical Garden (National Botanical Garden, Godavari, Lalitpur) and 10 district level Botanical gardens at various parts of the country www.dnpwc.gov.np [1].

Collection pressure is the reason behind the disappearance of Non-Timber Forest Plants in their native areas. In order to protect high value plants government had banned the collection, transportation, and trade of the *Dactylorhiza hatagirea* (D.Don) Soo and Bark of *Juglans regia* Linn. Similarly, *Neopicrorhizia scrophulariiflora* (Pennell) has also been banned for Export without identification and certification. Some other plant species that have been banned are assembled and kept in the appendix 2.

S. No	Scientific Name
1.	<i>Abies spectabilis</i> (D. Don) Mirb.
2.	<i>Cinnamomum glaucescens</i> (Nees) Hand.-Mazz.
3.	Lichens
4.	<i>Nardostachys grandiflora</i> DC.
5.	<i>Rauvolfia serpentina</i> (L.) Benth.ex Kurz
6.	<i>Taxus wallichiana</i> Zucc.
7.	<i>Valeriana jatamansi</i> Jones
8.	Rock exudate

Appendix 2

Table 2: Banned for export outside the country without processing (Not applicable for cultivated products). Source: (DPR, 2012) [1].

Methodology

Secondary data regarding the amount of the Medicinal and Plants collected from the different forest in five development region and revenue generated are hired from the publication of the Department of Plant Resource (Plant of Nepal: Fact Sheet) and Department of Forest (Hamro Ban). Literature regarding the information on medicinal and aromatic plants of the Nepal has been extracted from the online national and international journals, project reports, website, booklet, and online book. Existing laws, regulations, plans and policies documents related to Medicinal and Aromatic plants were thoroughly reviewed to analyze and correlate the government’s efforts and intervention for the development and prosperity of this particular sector. The research gap and problem are identified with the help of those literatures and documents. Excel spread sheet was used to input data available and thus for trend analysis of hence assembled data on revenue obtained from the community forest. Graphs are prepared with the help of excel.

Results and Conclusion

The altitudinal variation that facilitates climatic variability has given rise to plant diversity. Total of 10,091 species of plants has been documented which include 5884 species of flowering plants and remaining non-flowering species [3]. Among total species of plants available about ten percent are reported with medicinal and aromatic properties. Such valuable plants have been deployed for various purposes such as medicines, perfumes, and food. More than 75% Nepalese people still depend on the herbal plants as a local source of medicine for their primary health care and even contribute to the local and national economy hence becoming the source of the hand cash. The financial contribution made by Non-Timber

Forest Products (NTFPs), especially medicinal plants, is much higher than the timber products [12].

Social and economical influence of MAPs
Economical Aspect

Rural peoples of hills either with the knowledge on identification or purpose of use are involved in collection and gathering of such valuable medicinal and aromatic plants leaving their entire job aside. Even in some areas it is been noticed that there is provision of holidays in the schools since majority of parents with their children leaves home to collect and gather important herbs of medicinal value such as Yarshagumba (sinensis). Selling of those valuable herbs provides sufficient amount of lavish money to run rural livelihood for the next 6 months. That’s why the collection and trade of the MAPs become indispensable for the rural peoples of the hills and mountains in Nepal. Annually huge amount of the trade exit for the medicinal and aromatic plants which are mainly (about 90%) exported to the India which is the known as the centre for the trade of the raw and processed MAPs among Asian countries [13,14].

Nepal is gifted with over 701 species of medicinal herbs [3]. Out of the total, 250 species are traditionally used as medicines and more than 100 species are commercially collected from the wild and exported in raw form mainly to India. A smaller part is processed to essential oils within the country. The major essential oils produced in the country include dementholized oil, eucalyptus oil, mentha arvensis oil, anthopogon oil, artemisia oil, juniper berry oil, spikenard oil, valerian oil, wintergreen oil, Zanthoxylum oil, and massage oil [12].

A number of Medicinal and Aromatic Plants are cultivated mostly in national and community forests and in private lands in lower hills (Terai) such as mentha, lemongrass, citronella, palmarosa, chamomile, cinnamomum tamala, timur, soapnut and asparagus. There are many registered and unregistered producers, traders and companies involved in the trade of MAPs. The largest Associations in Nepal is the Jadibuti Association of Nepal (JABAN) with registered 300 members (producers, collectors, traders and exporters) located in Nepalgunj - being the main trading hub to India. In Kathmandu, the NEPPHA (Nepal Herbs and Herbal Products Association) is a large umbrella organization with registered 52 members of which 70% are manufacturers and 30% traders [15]. According to a study conducted by Asia Network for Sustainable Agriculture and Bio-resources (ANSAB), the employment that could be generated by this subsector is estimated to be 26,550,000 man days for

local people, which is an equivalent of six months or 180 days a year for 147,550 persons [12].

According to the NEHHPA, around 50% of local communities are involved in the collection and trade of MAPs or NTFPs. Around 90% of Non-Timber Forest Products is exported to India in raw form. Amala, Atis, Chiraito, Tejpat, Guchhi chyou, Jatamansi, Jhyau, Kutki, Pipla, Ritha, Sugandhawal, Sugandha Kokila and Timur are the major MAPs in such trade to India [12,16].

Even if the volume of exports decreased between 2010 and 2012, the trade in Medicinal and Plants plays a significant role in the economy of which an estimated 5% contribution to the Nepalese Gross Domestic Product (GDP). Acharya, *et al.* [17] concludes that there is a significant change in livelihood of resource dependent local communities after conservation and management of medicinal and aromatic plants take place. Incentives on management of MAPs, institutionalization of community based organizations, and direct support to forest user groups has certainly help in promotion of sustainable forests, diversity and richness of medicinal and aromatic plants, and sustainable livelihood.

Collection of the medicinal and aromatic plants requires permits and at the same time export of those valuable biological property need to pay tax that contributes to the revenues to the Government. About 85% of MAPs are collected from the wild which are mainly in the poor Far-Western and Mid-Western regions in Nepal. Butternut (chiuri) is largely available from the trees in the mid-western and far-western regions of Nepal with an estimated potential of 9,000 tonnes of butter for domestic consumption, soap making and exports [12].

Proportion of the revenue shared by the Non-timber forest product (NTFP) among the different development region is estimated. Analysis with the secondary data concludes that the western part of the Nepal viz. Farwestern development region and Mid-western development region contribute relatively much greater proportion of the revenue in the total revenue collected over the country. Most of the area of Far western and Mid-western development region is covered by the forest and the region is also renowned for relatively favorable climate for the growth of the valuable MAPs. Hot, humid and drier weather facilities the plants to synthesis medically essential constituent. The important revenue generating species listed in the annual report by Department of Plant Resources are Himalayan Ye, Loth Salla, Khoto Salla, Angeli, and Khayer [12].

Figure 1: Contribution shared by the each developmental region through their community forest NTFP products. Source: (Department of Plant Resources) [3].

Overall revenue in the country from the NTFP is not constant, it's ever changing. In the fiscal year 2066/67, amount of the NTFPs collected from national forests was 21, 71,522.3 kg which provide revenue of Rs. 2, 08, 50,762.4 to the government of Nepal. While in the year, 2060/61 amount of the NTFP collected was around 2856773.9 kg and revenue generated was Rs. 15986207.7.

Figure 2: Trend of the total revenue collected from the NTFP products from the community forest in Nepal. Source: (Department of Plant Resources) [3].

Collection and marketing of the valuable herbs in the mountain region of the Nepal has significantly helped the rural people to alleviate their poverty to a considerable extent. Besides that, it adds the employment opportunity for the people and provides a fabulous side job to lift their income. This fact is supported by the study conducted by FNCCI titled "Wholesale Market Assessment-NTFP" showed that Nepalese NTFP processors are unable to run processing plants year round because of a shortage of raw materials, which

mainly results from the lack of wholesale collection systems [14]. In this context, if Nepal could produce the commonly available Medicinal and Plants in the commercial scale then there would be high possibility of transforming current unviable economy to viable and vibrant economy.

Country possesses huge diversity of the plants that are valuable in terms of the medicinal use and essential oils extraction. The promotion of the cultivation of those high valued herbs or plants can provide the farmers handsome money. These can be value added for different other product. The government and private processing center will operate round the year if they get sufficient raw material inside the country. This will further enhance the cultivation of those high valued crops and will help in industrialization.

International trade of MAPs and essential oils is growing every year but Nepal's share in such trade is very small and mostly concentrated to India. Nepal Trade Integration Strategy (NTIS 2010) has also recognized this sector as having export potential, and has identified some major international markets where Nepal can diversify its exports to.

A large number of people, mainly in the hilly regions of western Nepal, are engaged in the collection of Medicinal and Aromatic Plants for their livelihood. Therefore, if developed well, MAPs and essential oils sector can contribute immensely in uplifting the socio-economic status of those people. Different laws, regulations, plans and policies formulated by the Government of Nepal have also encouraged the development of this sector. However, implementations of those plans and policies have not been effective [18].

Social Aspects

Most of the part of the Nepal depicts a typical rural phenotype. The majority of Nepal's population, especially the poor, tribal and ethnic groups, and mountain people, relies on traditional medical practices [19]. Nepalese communities are rich in the indigenous technological knowledge regarding the usage of the medicinal and aromatic plants. But newer generations are less relevant with these practices. There is gap in knowledge regarding identification, usage, and value addition of medicinally important plants from the parent generation to their children. Majority of the population is present in the rural region of the country. People having poor economic condition in the rural areas are primarily depended upon the traditional medicinal practices. These traditional medicinal systems are almost dependent upon the herbs having medicinal importance.

Indigenous and local communities have been using traditional and indigenous knowledge for centuries under local laws, customs and traditions. Additionally the rural people in hilly region of Nepal are associated with the collection and trade of the valuable MAPs which is their primary source of hand cash. This evidenced highly significant association of the Nepalese especially rural people with the MAPs for sustaining livelihood.

It is a matter of challenge and opportunity for government to increase the cultivated area of such valuable plants since most of the farmers are small land holders who primarily do subsistence mode of farming. Most of the land is dominated by the cereal and vegetable which provides a complete food for them. Integrated farming that is rooted in our society has many advantages than sole cropping. The farmers are mostly oriented toward such type of farming that could provide early returns with minimal risk. Farmers relatively have less innovation adoption due to many associated reasons like little ability for investment, illiteracy, etc. Thus it's a matter of challenge to persuade peoples to adopt MAPs cultivation.

But physiographical feature of Nepal creates an opportunity to enhance the cultivation of the medicinally important herbs due to many valuable reasons. Nepal is generally divisible into three ecological belts; lower plain land (Terai 17%), middle mid hills (64%) and upper high hills (19%). Terai is known as the 'grain basket' of the country since it shares most of the agriculture production. It also has fertile soil that is suitable for agriculture and is feeding major population of the country. Mid hills and high hills in the upper part of the country has bottlenecked infrastructural development due uneven land with relatively less preferable soil (rocky) for the farming. In Nepal there is huge wasted or fellow land that can be utilized to cultivate the medicinally important herbs. Most of the lands in the mid hills remain fallow due to uneven structure where Medicinal and Plants cultivation seems to have a good scope. Cultivation of the Medicinal and plants support the conservation of the forest area and different plants that in term results a sustainable agriculture [20].

Recommendation

The collection and trade of Medicinal and Aromatic Plants have been a source of income for rural people of Nepal yet country is lacking the comprehensive and effective assessment of distribution pattern of commonly and commercial adopted species, their trade and conservation measures. There is lack of quantitative assessment of their natural population and the feasibility study on their

cultivation in different eco-logical regions of the country. Natural forests are decreasing due to ever increasing human population. Many species of MAPs are already threatened from collection pressure. The natural population of commercially important MAPs is declining which has outputted serious risk of extinction. So it is pressingly imperative to explore their patterns along the different physiographic region of the country to launch effective conservation strategies and programs.

Medicinal and Aromatic plants are highly valuable agriculture commodity that are significantly providing employment opportunities, handsome money and contributing desperately to upgrade the food security condition in the mid and high hills of the country. The international trade of the MAPs has endowed many opportunities to the Nepalese traders and farmers to earn foreign currency. Although, this sector contributes significant amount in the Nepalese economy documentation has not been done how many of those commercially important medicinal and aromatics plants are belong to different life forms groups like trees, shrubs, climbers and herbs. Despite having immense potentialities to promote public health as well as to capture the national as well as international markets, the country is still far behind to grab the opportunities utilizing available resources. Hence, feasibility study for the commercialization of the medicinal and aromatic plants in the country is indeed needed to explore the potential of the MAPs cultivation in large scale to boost the rural economy along with the prioritization of the Ayurvedic medicine in the country like Nepal which is commonly known as hub of medicinally important herbs.

Besides enormous potential to grow the medicinally important plant their cultivation has gain setback in the comparison to the other agriculture commodity like cereal, vegetable, etc. due to many prevailing reasons. Little ability of the farmers to bear risk and the practice of the new innovation in the field has brought the cereal based mono-cropping pattern of farming in the community. At the same time inappropriate and insufficient mentoring about the identification of the valuable medicinal an aromatic plants, lacks of skills and planting materials, changing climate and plant adaptation, etc. are major factors making it much vulnerable.

Most of the people lives in the hilly regions where the poverty is deep rooted. Although the hills possess enormous opportunities yet people there are unable to ripe that. MAPs cultivation and marketing is one of the realms of agriculture which could transform

country's poverty to prosperity. Since commercialization of MAPs will provides employment, income and the necessary medicine and oils to the farmers. At the same time, farmers can locally process MAPs to prepare the local medicine using their indigenous skill and knowledge. The locally prepared medicine can be marketed to the traditional healers and other concerned body. This will help to upgrade the local economic through maximum resource utilization and will make the country self- sufficient in MAPs. Cultivation and commercialization of MAPs will also widen the scope of the establishment of the processing centers and the industries related to it. In this way one of the overlooked realms of agriculture can be made the way to the prosperity of the country. Due to all these reason and strong evidences this study is imperative for the upgrading the rural economy through promoting the cultivation, trade and processing of the medicinal and aromatic plants (MAPs).

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