

Chapter 4

Harnessing the Potential of Medicinal, Aromatic and Non-timber Forest Products for Improving the Livelihoods of Pastoralists and Farmers in Himalayan Mountains



Madhav B. Karki

Abstract Medicinal, aromatic, wild food and other health and wellness-related natural plant resources found in Himalayan highlands include rare, endangered and threatened plant species and non-timber wild products. These are commonly described as NTFPs and MAPs. Sustainable wild harvesting and primary processing of these herbs for addressing poverty of poor pastoralists, farmers and local traders is a major challenge. Medicinal plants not only play a pivotal role in providing primary healthcare for poor people in mountain areas; increasingly, these niche products are being gathered, processed and sold in national and international markets for higher cash income. Prominent examples of high-value but threatened medicinal plants that are commonly used in the Ayurvedic and Tibetan systems of traditional medicine (Sowa Rigpa) are as follows: *Ophiocordyceps sinensis*, *Neopicrorhiza scrophulariiflora*, *Picrorhiza kurroa*, *Nardostachys grandiflora*, *Dactylorhiza hatagirea*, *Podophyllum hexandrum*, *Aconitum* spp., etc. Experience gathered to date suggests that technical, socioeconomic, institutional and policy inputs and instruments are required to develop niche and high-volume production in pastoral systems. This chapter analyses and recommends the following actions in enhancing future scope: (a) raising awareness through different formal and informal education means, (b) skill development in sustainable harvesting as well as grazing management, (c) production of organic and sustainably managed products, (d) integration of agricultural and pastoral livelihoods with off-farm activities through value chain development of major niche products that have high-value capturing

M. B. Karki, Ph.D. (✉)

Executive Director, Centre for Green Economy Development Nepal (CGED-Nepal), Kathmandu, Nepal

Deputy Chair, IUCN Commission on Ecosystem Management (IUCN, CEM), Kathmandu, Nepal

Adjunct Professor, Institute of Forestry, Tribhuvan University, Kathmandu, Nepal
e-mail: karki.madhav@gmail.com

potential, (e) improvement of degraded pasture and farmlands to enhance productivity of niche products and services, (f) conservation through sustainable use-oriented policy and legal reforms to implement integrated strategies of linking conservation of wild fauna and flora with sustainable pastoral production systems and (g) expansion of ecologically sensitive low-input high-return tourism, using pastoralists to provide services, particularly through their indigenous knowledge and improved local production practices. These measures are expected to help Himalayan countries to achieve several SDGs especially goal nos.1 and 2.

Keywords Globalization and economic liberalization · Medicinal and aromatic plants · Ayurveda · Sowa Rigpa · Natural ecosystems · Organic niche products · Value chain · Pastoralism · Non-timber forest products · Sustainability · Biodiversity · Poverty reduction · Green mountain economy

4.1 Introduction and Background

Mountains occupy 24% of the global surface area and are home to 12% of the world's population. They have ecological, socioeconomic, spiritual and cultural significance, not only for those living in mountainous areas but also for people living beyond (SDC/ICIMOD/MP 2012). The international community recognized the importance of mountains at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil, both in 1992 and 2012 with the adoption of Chap. 13 in Agenda 21 and Para 210–212 in the Rio+20 outcome document: *Future We Want*. This underscores the role of mountains in implementing the global sustainable development agenda. Mountain ecosystems are among the most varied and rich in terms of endemic and high-value species (e.g. Vare et al. 2003; Moser et al. 2005; Spehn and Korner 2005). Mountains support about one-quarter of the planet's biodiversity and have nearly half of the world's biodiversity hotspots (Singh 2011). Mountain systems provide niche habitats for many rare and/or endangered endemic species (ICIMOD 2011).

Mountain communities are mainly traditional farmers and pastoralist societies. They have developed and maintained vast knowledge and experience on the use of natural resources including plant resources. Much of the mountain's rural economic activities, however, are based on unsustainable use of natural resources, resulting in deforestation, loss of biodiversity and degradation and destruction of natural habitats. Cultural and traditional knowledge systems and high values for nature are also fast vanishing along with natural resources.

Efforts to sustainably manage the region's medicinal, aromatic, natural and other medicinal, aromatic and non-timber forest product (MAPs and NTFPs) resources, especially in the least developed mountain countries, have not achieved the desired goals. Balancing the four pillars of sustainable development—social, environmental, economic and institutional—has been one of the key challenges for these countries. Although the traditional drivers—population growth, agriculture intensification and unsustainable harvesting—continue to have an influence, new drivers

of change such as climate change, globalization and outmigration of youth to overseas labour markets have added new problems and but also provided some opportunities such as increased remittance flow (ICIMOD 2019).

The markets for natural products, especially pharmaceuticals, food and nutrition products, are growing. Medicinal and aromatic plant products alone are estimated to command a market of more than USD \$80 billion. However, with the rise in demand for natural products, there is also a rise in biodiversity loss and an increase in the number of poor people dependent on forest products such as NTFPs/MAPs for livelihoods. Therefore, it is necessary to develop a sustainable use as well as economic growth strategy that can secure an equitable living standard for forest-dependent people while conserving ecosystem resources. For such a development model, which is now called green mountain economy, the importance of natural capital or ecosystem services will be high. Here the role of NTFPs and MAPs cannot be overstressed. Many local economies, especially in mountain ecosystems, are highly dependent on NTFPs and associated natural resources. Their role can be enhanced through green technologies, green growth strategies and by generating green jobs. Many countries—both developing and developed—already have institutions and governance systems that are implementing sustainable management of natural resources ensuring an equitable flow of benefits to the people involved. Many of these traditional institutions that have evolved over generations have led to a number of good practices that have been helping indigenous and local communities to cope with financial, ecological and social changes and challenges, protecting against the consequences of unavoidable changes in the external environment. In the Hindu Kush Himalayan (HKH) region, many pro-poor value chain development pilots conducted by research and development organizations have been successful (MoA/SNV 2011; Karki 2017).

Sustainable use and management of biodiversity resources such as NTFPs and MAPs are a high-priority topic in sustainable mountain development agenda. In recent years, ecological, social and economic roles of NTFPs are becoming increasingly significant owing to better understanding and appreciation of their contribution in promoting green economic growth. Growing market preference for green and natural products and consumers' emphasis on efficient and sustainable use of natural resources have also highlighted the added importance of sustainable commercialization of NTFPs and MAPs (Karki 2017). In recent years, NTFPs have gained much needed recognition along with the realization of the need to conserve forests and protect the biodiversity and ecosystem goods and services they provide. In many countries, especially in Nepal and other HKH countries enhanced access to NTFP/MAP resources has been providing a powerful incentive to local communities to protect forest tree cover while harvesting forest undergrowth only. In fact sustainable management of medicinal plants has been helping to achieve sustainable management of forest resources in many countries (IUFRO 2012).

4.2 Current Understanding of MAP and NTFP Subsectors

There is no universally accepted definition of the term “non-timber forest products”. FAO uses the term “nonwood forest products” and defines them as “products of biological origin other than wood derived from forests, other wooded land, and trees

outside forests; they may be gathered from the wild, or produced in forest plantations, agro-forestry schemes and from trees outside forests” (FAO 1999). Ahenkan and Boon (2011) have done an excellent compilation and analysis of the semantics and the difficulties in defining NTFPs. In some countries, NTFPs are also referred to as minor or special forest products (Hammett 1999). In some definitions, NTFPs include non-consumptive ecosystem services enjoyed by humanity such as ecological/environmental, cultural and religious and tourism and recreation values (Walter 1998). MAPs are not well defined in the literature but in general any plant or parts thereof used in any medical system such as *Ayurveda*, *Siddha*, *Unani*, *Sowa Rigpa* or in the ethnic healing system are generally categorized as medicinal plants. Aromatic plants are those that have aroma in their parts that are extractable in the form of essential oils (Sharma 2007). Together these groups of plants are called NTFPs and MAPs.

In this chapter, the NTFPs found in mountain and hilly ecosystems are considered to comprise non-timber floral, faunal and recreational products, including fuel wood, wood crafts, animal fodder and compost materials; medicinal, aromatic and dye plants; wild mushrooms, floral greens, decorative greenery and wild foods (nuts and seeds, berries, oil seeds, etc.); craft species; and products of ecotourism value derived from forests, rangelands and protected areas (Ghimire et al. 2008a). They also include game animals, furbearers, etc. NTFPs are increasingly considered high-value ecosystem goods and services that can transform the economies of forest-rich developing countries into low-carbon or green-growth-based economies. The common factor that cuts across all forest and biodiversity-dependent communities in the mountainous regions is the existence of high poverty and deprivation amidst rich biodiversity. Hence, there is a need to provide forest and biodiversity-based employment and sustainable livelihoods to the poor and marginalized communities while ensuring conservation of forests and natural habitats, which are becoming increasingly threatened. In this context, the role of non-timber forest products (NTFPs) becomes extremely important, because cutting and using timber products increases carbon intensity. With an expected increased investment in forestry and green sector, there is a real need for more systematic research and knowledge generation on the role and potential of NTFPs in assisting the attainment of sustainable development goals. This is the main argument of this chapter.

4.3 Livelihood Importance of MAPs and NTFPs in Mountains

Persistent poverty in developing mountainous countries in South Asia is generally linked with small, fragmented or no landholdings, accompanied by low productivity. Dependence on collection and gathering of NTFPs from forests to ensure food security goes largely unnoticed and is not accounted in the calculations of gross national product (GNP). Some of the products meet a global demand (e.g. raw material for pharmaceutical industries, edible nuts, honey, bamboo and cane products); others reach specific markets (e.g. crude herbs, aromatic and chemical products), while some NTFPs and MAPs are collected and consumed locally.

Forest-dependent communities across the mountainous regions derive their sustenance from NTFPs in periods of financial stress and have used them as raw materials for producing items of daily use in normal times. In least-developed mountainous countries such as Afghanistan, Nepal, Bhutan and Myanmar, NTFPs provide food, medicine, nutrition and cash income to poor and vulnerable households. NTFPs are extracted primarily from the wild for meeting the food, medicine and supplementary cash needs for the subsistence of poor households in these countries (Karki and Bhattarai 2012).

The role of the medicinal and aromatic plant resources in the economy of developing countries becomes even greater when high-value service sectors such as health, nutraceutical, organic and certified products and ecotourism and health tourism are taken into account and linked to overall sectoral development of forest conservation and development (Karki 2003, 2004, 2015; Karki et al. 2004).

4.4 Market Potentials and Constraints

It is estimated that more than 150 NTFPs are traded in international markets (FAO 1997). Among these, medicinal and aromatic plant products alone are estimated to command a market of more than USD \$80 billion (Karki and Nagpal 2004). The World Health Organization (WHO 2002) estimates that 80% of the global population relies on plant-based medicines for primary healthcare needs. Agrawal (2007) estimates the global market potential for NTFPs to reach as high as USD \$225 trillion by 2050. It is clear that NTFPs, besides providing multiple intangible benefits, also have huge economic potential and generate cash incomes, particularly for women and families that do not have access to agricultural lands and major markets, particularly in developing countries.

However, the inadequacy of market-related information and negotiation skills with the upstream producers in dealing with market forces, as well as unequal power relationships or lack of a level playing field between buyers and sellers, disadvantages the growers, collectors and local traders of NTFPs in mountainous regions. The supply chain of NTFP products is unnecessarily long, with a large number of commission agents eating into the returns that could go to the farmers. These are the major obstacles to the small-scale producers and growers of NTFPs that prevent them from benefitting from higher values. Forest users, landowners, harvesters and processors and policymakers can influence how NTFP resources are managed through the knowledge, practices and policies they suggest, design and implement, if they can all work within one single framework linking producers to markets and consumers.

The annual revenue from the sale of more than 33,000 tonnes of NTFPs is estimated to be between 13 and 26 million USD (GoN 2010). Most of the products are exported to India in crude or semi-processed form. But in the last few years, semi-processed or processed NTFPs are being exported to both Himalayan and other countries. Essential oils are the major exported commodities among processed

herbs that are extracted from more than 18 aromatic plants (Prakrit 2007; Ghimire et al. 2008b). The oils are mostly exported to Japan, the USA, Germany, Belgium and many other countries. The NTFPs other than MAPs exported by Nepal are handicraft items whose value was about Rs 300 million in 2004/2005 (Acharya 2006). The NTFPs thus are the major exports of Nepal. Nepal however also is one of the biggest consumers of processed medicinal products, most of which are imported from India, which is growing at an annual rate of 20%, (Ghimire et al. 2008a, b). Therefore, there is a tremendous possibility of improved management, processing and value addition of herbal products and other NTFPs in Nepal that can help alleviate poverty by meeting domestic as well as foreign markets and creating income generating opportunities locally (Tewari 2004; Sekar et al. 1996).

4.5 Employment, Health and Income Potential of MAPs and NTFPs

The NTFP sector is a very important source of rural employment (Ghimire et al. 2008a). According to FAO (1997, 1999), NTFPs contribute about 50% of forest revenue and 70% of income through export of different food, medicine and aroma products (Sekar et al. 1996). In India, the NTFP sector, including bamboo and rattan, medicinal plants and other subsectors, is estimated to employ poor people for more than 100 million person days (Tewari 2004) mainly in rural areas; about 200–300 million villagers depend on NTFPs to varying degrees. NTFPs also contribute 10–40% of income to the 50 million tribal households in India (FAO 1997). In Nepal, rural mountain communities derive up to 50% of their total family income from NTFPs including MAPs (Pyakurel and Baniya 2011). Thus, NTFPs can significantly help in livelihood diversification of vulnerable mountain communities affected by downturns in other resource sectors as a result of land and forest degradation, which is often aggravated by growing climate variability. Ayurveda, the oldest medical system in the Indian subcontinent, and traditional Chinese medicine (TCM) have alone reported using approximately 2000–3000 medicinal plant species (Prajapati ND et al. 2003). The *Charaka Samhita*, an ancient handwritten document on herbal therapy in India, reports on the production of 340 herbal drugs and their indigenous uses based on wild collection of NTFPs (Bhattacharya, Rajasri et al. 2006). Worldwide, it is estimated that approximately 25% of all pharmaceutical drugs are derived from plants, and many others are synthetic analogues built on prototype compounds isolated from plant species (Rao et al. 2004).

4.6 Key Issues in Sustainable Use of NTFPs and MAPs

Mountainous countries face numerous challenges in instituting sustainable use policies. Different countries are interpreting sustainable use regime differently and are embarking on different approaches to promote NTFP-based economic growth

concepts and practices for sustainable development. NTFP-based green economic development can be a means to achieve sustainable use of MAPs and NTFPs in mountains. However, the common challenges mountain countries are confronting or will face in future are as follows: (a) How to document sustainable NTFP/MAP management cases on which the future sustainable development pathways can be charted? (b) How effective are the current approaches, and what lessons can be learned from the experiences, particularly in terms of management systems, and their successes and failures? Although NTFPs can be viewed from the perspective of economic development, they must also be considered in terms of biodiversity conservation and sustainable use (Karki 2017). The supply of wild plant NTFPs/MAPs is dwindling given the threats of increasing demand, a rapidly increasing human population and rampant destruction of plant-rich habitats. Medicinal and aromatic plants provide a good example. At the current rate of consumption and use, the status of many of these plants along with the future supply of raw materials and benefits generated by them is likely to be severely threatened. Although cultivation is playing an increasing role in the supply of MAPs, most will be obtained from wild collection in the foreseeable future; thus, their sustainable management is essential. There is no “golden rule” that can be applied universally to ensure conservation and sustainable medicinal plant management, because what is defined as conservation and sustainability will vary with type of plant, part used, locality and other factors. Bhutan banned the export of medicinal plants and other NTFPs in 1988 as a measure to conserve biodiversity and to prevent uncontrolled exploitation of these resources (FAO 1996). The “Framework for Collection and Management of Non-Wood Forest Products” (RGoB 2009) has permitted communities to collect medicinal plants and other NTFPs for non-commercial uses, considering conservation and sustainability of the resources. The government has identified seven species as “extremely rare” and 26 species as “rare” and has launched conservation and management initiatives for protecting them.

In China, the state has protected 116 species of medicinal plants used in TCM (CCTHM 1995). The government has proposed six large important plant areas (IPAs) for medicinal plants and other NTFPs in the Chinese Himalayan region, covering an area of 434,200 km² (Hamilton and Radford 2007). There are 2400 nature reserves covering 14.8% of the total land and 60% of the country’s plant species that are designated for in situ conservation and management for sustainably harvesting medicinal plants benefiting the local population. Regarding ex situ conservation, there are ten state-managed medicinal plant gardens and germplasm banks, 220 botanical gardens (2006), about 5000 species of medicinal plants and other NTFPs cultivated in these botanical gardens (Pei and Sajise 1993). In India, Conservation Assessment and Management Plan (CAMP) workshops, following the IUCN criteria, have been organized in major parts of the country, including all the Himalayan states.

The National Medicinal Plants Board (NMPB) of India, chaired by the Union Health Minister, was established in 2000 and has prioritized 31 species of medicinal plants for conservation, management and cultivation. State-level Medicinal Plants Boards have been established in 26 states of the country. Considering the state-level

activities for conservation and management of MAPs/NTFPs, in 2004, Uttarakhand declared itself as an Herbal State with a plan of action for the conservation, management and development of the NTFP sector. The Uttarakhand state government has prioritized 26 species of medicinal and aromatic plants for conservation in the wild and for cultivation. The state is also supporting farmers for cultivating the 26 prioritized species with 50% assistance on cultivation cost up to a maximum of 1,000,000 Indian rupees (USD 2000). By 2010, about 8000 private organic herbal farms had been registered. The state government has established large number of medicinal plant nurseries and provides free planting materials for registered farmers and *Van Panchayat* (Forest Council) members as a strategy to enrich plantations in the forests. In 1998, the Government of Sikkim imposed a ban on grazing in reserved forests, on plantation areas and around water source areas, and in 2000, it imposed a total ban on lopping of selected trees and collection of selected medicinal herbs. Sikkim has brought 34,000 farmers cultivating 18,000 ha in the organic farming regime.

The Government of Nepal has imposed different levels of restrictions in the collection, trade and export of some of the highly traded medicinal plants to safeguard them in the wild and to promote cultivation practices. The CAMP workshop (Tandon et al. 2001) evaluated 51 commercial MAPs and NTFPs for their status in the wild. In 2000, Nepal established the high-level Herbs and NTFP Coordination Committee (HNCC), chaired by the Minister of Forests and Soil Conservation, to formulate and implement MAP/NTFP-related policies and to streamline the NTFP sector in the country. The Herbs and NTFP Development Policy 2004 is a milestone in the country's strategy to conserve and sustainably manage the MAPs and NTFP sectors. It includes six policy objectives, five policy groups and 28 development strategies. In general, the policy identifies national challenges, opportunities and priorities and provides an outline for moving forward. The HNCC prioritized 30 species of MAPs/NTFPs for conservation, research, development and management, including 12 species recommended for cultivation (GoN 2010).

Pakistan, in 2001, assessed the threat of 52 species of commercial medicinal plants following the IUCN criteria. Later in 2010, the government prioritized 24 commercial medicinal plant species (including 12 endangered and 12 vulnerable species) and has made provisions to conserve and manage them through different administrative and management units (Hamilton and Radford 2007).

4.7 Area for Improvement: Local Value Additions and Value Chain Development

The world market for natural products and organically derived NTFPs, including medicinal plant products, has been increasing, and consumers have become more conscious of the source and quality of the products they purchase. According to FAO, organic trade is expanding at the rate of 15–20% per year, and more than 100 countries currently export certified organic products (Choudhary and Bhattarai

2008). However, the global trade in organic products is hindered by a multitude of standards, regulations and conformity assessment systems. There are currently two international standards for organic agriculture: the FAO/World Health Organization (WHO) Codex Alimentarius Commission Guideline-based standards and the International Federation of Organic Agriculture Movements (IFOAM) basic standards. This means that products certified as organic in one system may not be easily recognized as organic under another, causing problems and increased costs for organic producers and exporters who want to sell in different markets.

The potential for small holders and other marginal community groups to diversify and enhance their livelihoods is particularly significant when harvesters become involved in “value addition” activities associated with the packaging of goods or the manufacture of secondary products and when they engage in responsible trade of medicinal plants and other NTFPs. Investigating the market and the means to access it can enable NTFP cooperatives and other farm organizations to understand opportunities and develop strategies to meet the needs of its members and buyers. The objective is to create economic enterprises in which the livelihood base and activities of entire communities are upgraded and not just a few micro-entrepreneurs. Clearly, providing a delicate balance between the two depends on socioeconomic and cultural factors as well as the more obvious technological and biological support systems.

At the local level, improved marketing requires capable organizations such as cooperatives or other farm associations. These organizations can help take decisions of common interest and undertake collective actions. By working together, members of an organization can gain bargaining power with traders and middlemen and maximize their incomes. An organizational marketing strategy can also help reduce risks for producers.

A number of factors influence the ability of producers to respond to customer needs and wants. Some can be influenced by farmers and producers, while others are beyond their control. Although small-scale farmers have some marketing skills, they could benefit from the specialized expertise and more efficient marketing made possible through marketing associations. This means that capacity building is needed at village, regional and national levels to identify promising NTFPs and to manage their harvesting, production and marketing. Extension workers, nongovernmental organizations and community leaders can be important agents for introducing marketing to small farmers.

Indigenous and local knowledge on plants and the innovation practices of traditional communities can be useful tools in developing new ways of conserving and using NTFPs for the benefit of mountain communities. As well, integrating the indigenous knowledge based good practices with scientific knowhow will provide robust knowledge and good practices for achieving the UN sustainable development goals. The approach has to document this knowledge and apply it to bridge the gap between the understanding and needs of government agencies, the public sector, local communities and the private sector based on systematic NTFP/MAP-based knowledge management. One aim is to provide local NTFP users with viable incentives to refrain from unsustainable harvesting and of NTFPs while providing local and national economic benefits.

ICIMOD has pioneered development of commodity-wise value chains for selected NTFPs in the Hindu Kush Himalayan region (ICIMOD 2011). ICIMOD has developed a mountain-specific value chain approach and framework for more participatory and equitable engagement of collectors, producers, local traders and processors in NTFP value chain development and livelihood improvement. One project, for example, analysed the prevailing supply chains of *Cinnamomum tamala* (Indian bay leaf) in Nepal and India (Choudhary et al. 2011). Through awareness raising, training and capacity building of both producers and buyers, it helped establish a business partnership between poor producers and markets trading in essential oils and spices. This has doubled the income of producers in the Chamoli district of Uttarakhand, India, and the Udayapur district of Nepal. A detailed analysis showed that around 900 tonnes of raw bay leaves were harvested in Udaipur district, Nepal, and 20–40 tonnes in the Indian project sites were produced and exported annually. In the Nepal case, a local company, with a buy-back relationship with local producers, was using nearly 25% of the total bay leaf, producing essential oil. An estimated 2150 tonnes of bay leaves were sent from Nepal to India every year. Farmers in Nepal earned a gross margin of 11% and traders 34%; collectors in India had a margin of 10% and traders 17% (Choudhary and Bhattarai 2011). The bay leaf value chain has shown that by addressing underlying inequality and power differences between the upstream producers and downstream actors, we can achieve equitable benefit sharing (ICIMOD 2011).

4.8 NTFP-Based Mountain Green Economy: Challenges and Opportunities for Mountainous Regions

The green economy as we understand today has been around – at least conceptually – for a very long time. Communities and societies in forest- and biodiversity-rich mountain countries that were forced by technological and other resource constraints and by the inaccessibility, marginality and fragility of their environment to live at subsistence level have developed cultural norms, social contracts and management systems to ensure their livelihoods and the sustainability of the resource base. The original idea of the green economy as developed by ecologists and environmentalists was largely based on sustainable extraction and utilization of natural products while meeting high social standards. This approach, however, was limiting the kind of economic growth that the current green economy approach expounds (IUFRO 2012). Medicinal and aromatic plant (MAP) conservation and development and organic agriculture efforts practiced in Bhutan, India and Nepal provide examples of growth models based on this kind of economic development approach. Karki (2011) recently conducted a comprehensive assessment of successful case studies in the Asia Pacific mountain regions in the context of sustainable mountain development in which forest and NTFP management figure prominently. The case studies suggest that NTFPs are the most important biological resources for socioeconomically uplifting poor and marginal communities. NTFP sector development has impact on all three pillars of sustainable development—ecological, economic and social—in a balanced manner. NTFPs meet the criteria for green economy and

green growth in that the resources are plentiful, management technologies are simple and accessible to poor and enterprising communities and markets (especially for herbal medicines, nutraceuticals and organic food) are growing worldwide.

Some of the key issues identified were lack of organizing skills among the producers, lack of market information and access to producers, absence of technologies for value addition, lack of sustainable harvesting and management skills, lack of capacity to conform to market requirements, policy hurdles to access to NTFP resources on government land and bureaucratic hurdles. Interventions were identified based on the issues identified, using a multistakeholder approach integrating poverty and gender dimensions. Market information, especially product prices, was gathered systematically. Partnerships between concerned government line agencies and the research team focused on building the capacity of local institutions in skills such as collection, grading, sorting and packaging of bay leaves. Training programmes also focused on group formation, bay leaf cultivation and management, sustainable harvesting and community-based enterprise development. Networks of buyers, local traders and exporters and producers were formed and strengthened. An effort to improve access to markets by bringing them closer to the production sites was piloted in India.

The value chain interventions led to immediate benefits for the poor producers in terms of increased income, increased knowledge and skills and gender equality. The outcomes could also be seen in improved education and health of the children of the producer families. Improved harvesting practices lead to improved quality of raw materials and finished products. With the market for NTFPs, especially medicinal plants, growing in South Asia and particularly in India and China, ICIMOD is scaling up and scaling out these experiences and promoting cross-border learning and sharing of good practices.

4.9 Conclusions and Recommendations

An NTFP/MAP-based green mountain economy not only should aim to increase production and income but also provides a basis for integrated and sustainable management of mountain natural resources. Taking the concept of green economy forward would call for a balanced and holistic approach to NTFP and MAP resources, as well as fundamental institutional changes and governance reforms. Technical inputs combined with traditional knowledge produce an adaptive technology that is based on the cultural, social, environmental and economic factors that are relevant to the local population; if adopted systematically, it can improve livelihoods.

Local knowledge about plants and the innovation systems of individuals and communities are useful in the search for new ways to conserve and use plants for the benefit of the communities as well as for achieving wider development goals. Given the overlapping benefits of enhancing access to affordable healthcare to poor through traditional system of medicine, providing livelihoods to local communities and enabling them to practice sustainable use of medicinal plants, specifically rare, endangered and threatened species is a viable policy. It is clear that work to promote the sustainable conservation and management of NTFPs and to build on indigenous and local knowledge and traditional practices can make valuable contributions to

achieving the general socioeconomic advances spelled out in the Unsustainable Development Goals (SDG) including Paris Agreement.

Much has been said about the impact of globalization and economic liberalization on the lives of the poor. No doubt poor and disadvantaged mountain communities have been mostly losers. Therefore, there is an urgent need to undertake liberalization from the point of view of the poor. Specifically in promoting NTFP/MAP-based green economy, there is a need to use adaptive technologies and improved collection, processing and trade channels on a rational and efficient manner. Also, appropriate processing and value addition facilities need to be developed as close to the production and collection areas in mountain regions. It will be possible to bring about positive change in the livelihoods of NTFP/MAP-dependent poor people by developing transparent value chain development and fair and equitable sharing of benefits in marketing practices. It is also necessary to develop new products and new uses for popular products, with a reliable market destinations. In addition, the new attitude of green consumerism resulting from the concern for environmental conservation and the consequent preference for natural products is providing new opportunities for NTFPs.

A systematic approach to enhancing the contribution of NTFPs should involve the usual planning cycle: formulation of objectives, preparation of strategy, action planning, implementing, monitoring and appraisal of conservation and development projects and programmes. There is also increased requirement for NTFP managers to understand the resource status, potential and trend to develop sustainable use regime. All major stakeholders need to participate in decision-making and cost and benefit sharing and that effective procedures are implemented to resolve conflicts. Finally, policymakers and development agencies need to better understand the changing role of NTFP and MAP resources, especially those harvested from wild sources, for improving local livelihoods.

References

- Acharya D (2006) Nepali Hate Kagajko Antarik Bazaar: Ek Charcha, (in Nepali), *Smarika*. Nepal Hate Kagaj Sangh, Kathmandu
- Agrawal SC (2007) Global view of medicinal plants: development of medicinal plants sector in Chhattisgarh. Chhattisgarh State Medicinal Plants Board, Raipur
- Ahenkan A, Boon E (2011) Non-timber forest products (NTFPs): clearing the confusion in semantics. Vrije Universiteit, Human Ecology Department, Brussels
- Bhattacharyya, Rajasri (2006) Conservation and documentation of the medicinal plant resources of India; Authors: Rajasri Bhattacharyya, Sabita Bhattacharyya, Siddhartha Chaudhuri; In: Biodiversity and Conservation, 2006, Vol. 15, Pp. 2705–2717
- Chinese Corporation of Traditional and Herbal Medicines [CCTHM] (1995) Outline of Chinese medicinal resources. Science Press, Beijing
- Choudhary D, Bhattarai N (2008) Organic production and certification of MAPs: experience of MAPPA. In: Chaudhary P, Aryal K, Tharu D (eds) Proceedings of international workshop on opportunities and challenges of organic production and marketing in South Asia. Nepal Permaculture Group and Ministry of Agriculture and Cooperatives, Kathmandu, pp 95–103.

- Choudhary D, Pandit BH, Kinhal G, Kollmair M (2011) Pro-poor value chain development for high value products in mountain regions: Indian bay leaf. International Centre for Integrated Mountain Development [ICIMOD], Kathmandu
- FAO (1996) Non-wood forest products of Bhutan, RAP Publication No. 1996/6. The Food and Agriculture Organization of the United Nations, Bangkok
- Food and Agriculture Organization of the United Nations [FAO] (1997) Proceedings of the regional expert consultation on the Asian network on medicinal and aromatic plants. FAO Regional Office for Asia and the Pacific Publication 1997/6, Bangkok
- Food and Agriculture Organization of the United Nations [FAO] (1999) Towards a harmonized definition of non-wood forest products. *Unasylva* 50(198):63–64
- Ghimire SK, Pyakurel D, Nepal BK, Sapkota IB, Parajuli RR, Oli BR (2008a) A manual of NTFPs of Nepal Himalaya. Gair Kastha Ban Paidawar Digdharshan (in Nepali). World Wildlife Fund Nepal, Kathmandu
- Ghimire SK, Sapkota IB, Oli BR, Parajuli RR (2008b) Non timber forest products of Nepal Himalaya: database of some important species found in the mountain protected areas and surrounding regions. World Wildlife Fund Nepal, Kathmandu
- Government of Nepal [GoN] (2010) Country report—Nepal: state of forestry in Nepal, a synopsis report. Government of Nepal, Department of Forests, Kathmandu
- Hamilton AC, Radford EA (2007) Identification and conservation of important plant areas for medicinal plants in the Himalaya. Plantlife International (UK) and Ethnobotanical Society of Nepal, Kathmandu
- Hammitt AL (1999) Special forest products: identifying opportunities for sustainable forest-based development (part 1). *Virginia Forest Landowner Update* 13(1)
- ICIMOD (2011) Green economy for sustainable mountain development—a concept paper for Rio+20 and beyond. International Centre for Integrated Mountain Development, Kathmandu
- ICIMOD (2019) The Hindu Kush Himalaya assessment. Springer, Nature, 2019. International Centre for Integrated Mountain Development (ICIMOD), Kathmandu
- IUFRO (2012) Enhancing the contribution of non-timber forest products in supporting green economy and sustainable development in mountain countries. In: Keynote Paper (KN04); Authors: Karki MB, Bhattarai N; presented in 2012 IUFRO Conference Division 5: forest products conference; 8–13 July 12—Estoril Congress Centre, Lisbon. <https://www.iufro.org/fileadmin/material/publications/proceedings-archive/50000-estoril12.pdf>
- Karki M (2003) Certification and marketing strategies for sustainable commercialisation of medicinal and aromatic plants in South Asia. In: IUFRO All Division 5 conference on forest products, Rotorua
- Karki M (2004) Institutional development process in medicinal plants sector: a case study of Nepal. In: Thomas YY, Karki M (eds) Proceedings of wise practices in sustainable management of Himalayan medicinal plants. People and Plants International and International Development Research Centre, Kathmandu
- Karki M (2015) Challenges, opportunities and trade off in commercialization of medicinal and aromatic plants in South Asia Region (www.Academia.edu)
- Karki M (2011) Sustainable mountain development 1992, 2012, and beyond: Rio+20 assessment report for the Hindu Kush Himalaya Region, a joint publication of ICIMOD, Kathmandu and the Swiss Development Cooperation. International Centre for Integrated Mountain Development, Kathmandu
- Karki M, Nirmal B (2012) Enhancing the contribution of non-timber forest products in supporting green economy and sustainable development in mountainous regions. Invited Keynote Paper submitted for presentation at the 2012 IUFRO Conference on Forest Products; 12–17 July 2012: Lisbon, Portugal
- Karki MB (2017) Challenges, opportunities and trade-offs in commercialization of medicinal and aromatic plants in South Asia Region. In: Invited paper presented at the workshop on current challenges and recommendations. Government of India, New Delhi. https://www.academia.edu/12863952/CHALLENGES_OPPORTUNITIES_AND_TRADEOFFS_IN_COMMERCIALIZATION_OF_MEDICINAL_AND_AROMATIC_PLANTS_IN_SOUTH_ASIA_REGION?auto=download

- Karki M, Nagpal A (2004) Commercialization of medicinal, aromatic and other NTFPs in Nepal. In: Bhattarai N, Karki M (eds) Proceedings of the national workshop on local experience-based national strategy for organic production and management of MAPs/NTFPs in Nepal. Government of Nepal, International Development Research Centre, MAPPA, and CCO, Kathmandu, pp 165–175
- Karki M, Tiwari BK, Badoni AK, Bhattarai NK (2004) Creating livelihoods-enhancing and biodiversity-rich production systems based on medicinal and aromatic plants: preliminary lessons from South Asia. In: Third world congress on medicinal and aromatic plants for human welfare, Chiang Mai
- MOA/SNV (2011) Value chain analysis of Timur. High value agriculture project in hills and mountain area (HVAP), Ministry of Agriculture Development/SNV. IFAD Project
- Moser D, Dullinger S, Englisch T, Niklfeld H, Plutzer C, Sauberer N, Zechmeister HG, Grabherr G (2005) Environmental determinants of vascular plant species richness in the Austrian Alps. *J Biogeogr* 32:1117–1127
- Pei S, Sajise P (1993) Regional study on biodiversity: concepts, frameworks, and methods. Yunnan University Press, Yunnan
- Prajapati ND, Puruhit SS, Sharma AK, Kumar T (2003) A handbook of medicinal plants. Agrobios Company, Dehradun
- Prakrit (2007) Sugandhit Tel Niryatma Dekhiyika Samasyaharu (Problems in aromatic oil export), (in Nepali). *Prakrit* 3(1):9–15
- Pyakurel D, Baniya A (2011) NTFPs: impetus for conservation and livelihood support in Nepal, a reference book on ecology, conservation, product development and economic analysis of selected NTFPs of Langtang area in the sacred Himalayan landscape. World Wildlife Fund Nepal, Kathmandu
- Rao MR, Palada MC, Becker BN (2004) Medicinal and aromatic plants in agro-forestry systems. *Agrofor Syst* 61:107–122
- Royal Government of Bhutan [RGoB] (2009) Interim framework for collection and management of non-wood forest products. Social Forestry Division, Department of Forests, Ministry of Agriculture, Thimphu
- Sharma UR (2007) Medicinal and aromatic plants: a growing commercial sector of Nepal; In: The Initiation - 2007, SUFFREC/KAFCOL, Kathmandu, Nepal
- SDC/ICIMOD/Mountain Partnership (2012) Sustainable mountain development in the Hindu Kush – Himalaya: from Rio 1992 to Rio 2012 and beyond. ICIMOD, Kathmandu
- Sekar C, Vinaya Rai RS, Ramasany C (1996) Role of minor forest products in tribal economy of India: a case study. *J Trop For Sci* 8(3):280–288
- Singh SP (2011) Mountain biodiversity and recreational ecosystem services in the context of green economy. In: International conference on green economy and sustainable mountain development. International Centre for Integrated Mountain Development, Kathmandu
- Spehn E, Körner C (2005) A global assessment of mountain biodiversity and its functions. In: Huber UM, Bugmann HKM, Reasoner MA (eds) Global change and mountain regions: an overview of current knowledge. Springer, Berlin, pp 393–400
- Tandon V, Bhattarai NK, Karki M (eds) (2001) Conservation assessment and management plan workshop report, 18–20 January, Pokhara, Nepal. MAPPA/IDRC/MFSC, Government of Nepal, Kathmandu
- Tewari DN (2004) Report to the planning commission, Government of India on potentials of bamboo cultivation and utilization in India. Planning Commission, Government of India, New Delhi
- Vare H, Lampinen R, Humphries C, Williams P (2003) Taxonomic diversity of vascular plants in the European alpine areas. In: Nagy L, Grabherr G, Körner C, Thompson DBA (eds) Alpine biodiversity in Europe: a Europe-wide assessment of biological richness. Springer, Berlin, pp 133–148
- Walter S (1998) The utilization of non timber forest products in the rainforests of Madagascar: a case study. *Plant Res Dev* 47(48):121–144
- World Health Organization [WHO] (2002) WHO traditional medicine strategy 2002–2005. World Health Organization, Geneva