# Local Communities in Nepal Himalaya – Towards Meeting International Standard of Sustainability on NTFPs Management

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## Abstract

International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP) is being piloted in Kangchanjunga Conservation Area, Nepal. The process to develop ISSC-MAP began in 2004 as a joint initiative of the German Federal Agency for Nature Conservation, the IUCN Medicinal Plant Specialist Group, WWF Germany and TRAFFIC.

An estimated 50,000 - 70,000 plant species are used in traditional and modern medicine throughout the world, and in Nepal nearly 700 species are used for these purposes. These species make an essential contribution to healthcare, provide an important source of income to rural harvesters, and, along with species used more for their aromatic properties, fuel a major industry in herbal products, pharmaceuticals and fragrances. The majority of MAP species used today are collected from the wild. Unfortunately, available information suggests that up to 15,000 MAP species could be threatened worldwide, many as a direct result of unsustainable collection practices. This pattern is likely to continue for the foreseeable future due to the high costs of domestication and cultivation of MAP species and other factors. Industry, governments, organic certifiers, resource managers and collectors are looking for a means to assess whether wild collection is sustainable. Consumers also want evidence that products are produced sustainably. ISSC-MAP has been developed to meet this need, and is the product of consultation with wide stakeholders. It focuses on ecological aspects of good collection practices. Social and economic factors are also addressed. ISSC-MAP builds on but does not replace existing principles and standards for sustainable forest practices, organic production, good agricultural practices, fair trade, and product quality.

With this pilot initiative, the local communities, council members, chamber members, community forestry federations, and other stakeholders have shown much interest on the standard, its potential impacts on conservation and livelihoods, and are enthusiastic on the process.

**Key words***: Medicinal and aromatic plants, sustainability, responsible business practices, local communities, Nepal Himalaya*

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## 1. Global context

Medicinal and aromatic plants (MAP) have been an important resource for human health care from prehistoric times to the present day. According to the World Health Organization (WHO), the majority of the world's human population, especially in developing countries, depends on traditional medicine based on MAP (WHO 2002). Between 50,000 and 70,000 plant species are known to be used in traditional and modern medicinal systems throughout the world (SCHIPPMANN et al. 2006). About 3,000 MAP species are traded internationally (LANGE and SCHIPPMANN 1997), while an even larger number of MAP species are found in local, national, and regional trade. Relatively few MAP species are cultivated, however. The great majority of MAP species in trade are wild-collected (LANGE and SCHIPPMANN 1997; SRIVASTAVA et al. 1996; XIAO PEN-GEN 1991). This trend is likely to continue over the long term due to numerous factors, including:

- Little is known about the growth and reproduction requirements of most MAP species, which are derived from many taxonomic groups for which there is little or no experience of cultivation.

- The time, research, and experience leading to domestication and cultivation are costly, and relatively few MAP species have the large and reliable markets required to support these inputs.

- In many communities where wild collection of MAP is an important source of income, land for cultivation of non-food crops is limited.

Moreover, cultivation may provide fewer environmental, social, and economic benefits than wild collection of some MAP species. Wild collection of MAP secures valuable income for many rural households, especially in developing countries, and is an important factor in the source countries' local economies (SCHIPPMANN et al. 2006). Wild collection also can provide incentives for conservation and sustainable use of forests and other important plant areas. However, over-harvesting, land conversion, and habitat loss increasingly threaten a considerable portion (approximately 15,000 species, or 21 per cent) of the world's MAP species and populations (SCHIPPMANN et al. 2006). For these reasons, approaches to wild MAP collection that engage local, regional, and international collection enterprises and markets, along with governments and healthcare providers, in the work of conservation and sustainable use of MAP resources are urgently needed.

Existing principles and guidelines for conservation and sustainable use of medicinal plants address primarily the national and international political level, but only indirectly provide governments, the medicinal plant industry and other stakeholders, including collectors, with specific guidance on sustainable sourcing practices (Figure 1). For example, the revised *Guidelines on the Conservation of Medicinal Plants* (WHO/IUCN/WWF/TRAFFIC forthcoming) and the *WHO*

*Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plants* (WHO 2003) provide general recommendations addressed primarily to governments and other political stakeholders, NGOs, GOs and businesses world-wide. These guidelines call for, but do not provide, concrete principles and criteria for the conservation and sustainable use of medicinal plants. The ISSC-MAP provides a practical interface between the general recommendations set out in these *Guidelines*, and management plans that must be developed for particular species and specific situations. Other existing or proposed standards for the sustainable collection of non-timber forest products (NTFP) provide useful models for MAP. Models for sustainable harvest of NTFP that may be particularly useful for MAP include the certification systems of the Forest Stewardship Council (FSC), the International Federation of Organic Agricultural Movements (IFOAM), and Fairtrade Labelling Organizations International (FLO). Other important models include natural resource co-management agreements with indigenous communities, and access and benefit sharing arrangements between genetic resource users and providers.

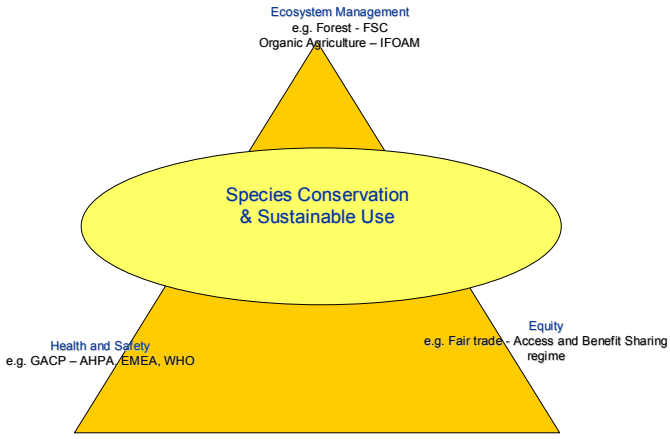



Figure 1: Existing framework and gaps

The ISSC-MAP builds on existing principles, guidelines, and standards, but expands and extends these to provide principles and criteria more relevant to the sustainable wild collection of MAP resources. Implementing the ISSC-MAP will benefit ecological resources or area managers, industry, and local collectors by providing a reputable standard of good practice for sustainable wild collection against which local performance can be designed and monitored with criteria and verified with indicators relevant to MAP resources. Harmonization with appropriate ecosystem, fair trade, production, product quality, and other relevant standards is considered an important avenue for developing and implementing the ISSC-MAP. The ISSC-MAP is designed to be applicable to the wide array of geographic, ecological, cultural, economic, and trade conditions in which wild-

collection of MAP resources occurs. It primarily addresses wild collection of medicinal and aromatic plant materials for commercial purposes, rather than for subsistence or local use. The Standard focuses on best ecological practices but also aims to support responsible social standards and business practices that affect collectors and collection operations, because these elements in turn affect the management of collected species and collection areas.

**2. ISSC-MAP, its purpose and structure**

The purpose of the ISSC-MAP is to ensure the continued use and long-term survival of MAP species and populations in their habitats, while respecting the traditions, cultures and livelihoods of all stakeholders (BfN Skripten 2007).

The objectives of this Standard are:

- To provide a framework of principles and criteria that can be applied to the management of MAP species and their ecosystems;
- To provide guidance for management planning;
- To serve as a basis for monitoring and reporting; and
- To recommend requirements for certification of sustainable wild collection of MAP resources.

The ISSC-MAP bridges the gap between existing broad conservation guidelines and management plans developed for specific local conditions. Adopting the principles and applying the criteria that make up the ISSC-MAP will help private companies, government agencies, research centers, and communities to identify and follow good practices for the following six key elements of sustainable wild collection of MAP:

1. Maintaining wild MAP resources
2. Preventing negative environmental impacts
3. Complying with laws, regulations, and agreements
4. Respecting customary rights
5. Applying responsible management practices
6. Applying responsible business practices

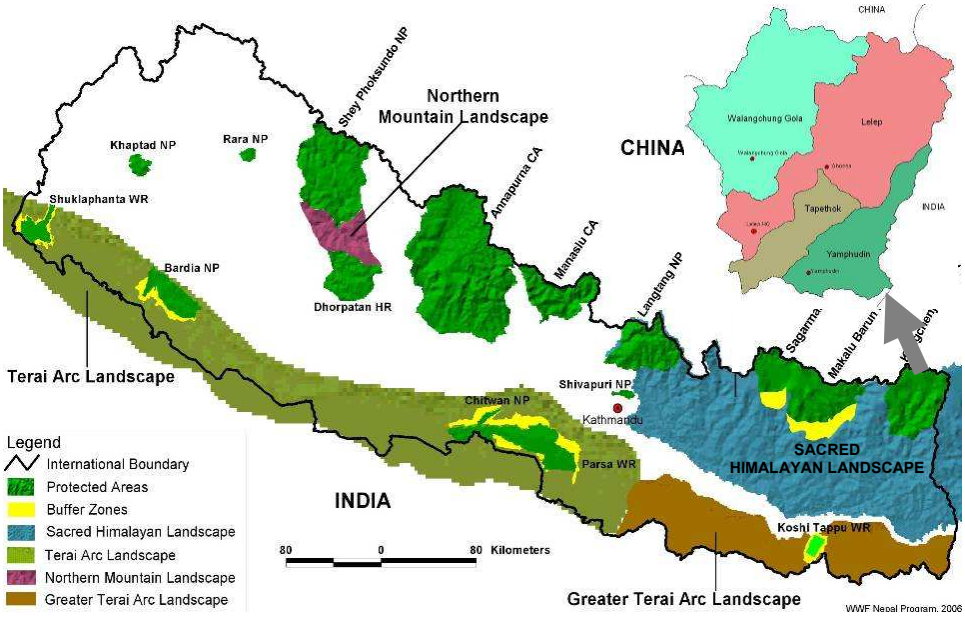
With respect to each of these six principles, ISSC-MAP provides clear criteria, indicators and verifiers that will enable industry, resource managers, collectors and other stakeholders to assess and monitor the sustainability of wild resources and collection practices. Since 2004, the process to elaborate this Standard thus far has been funded by the German Federal Agency for Nature Conservation / Bundesamt für Naturschutz (BfN) in association with The World Conservation Union (IUCN), WWF Germany, and TRAFFIC with substantial contributions of time and expertise from members of an international Advisory Group and country-field projects technical coordinators. There are six pilot implementation projects around the world – Brazil, Nepal, China, Cambodia, Lesotho, and India. Field consultations and implementation/research projects have been, and will

continue to be supported by numerous other agencies, organizations, and businesses.

## 3. Piloting of ISSC-MAP – a case from Sacred Himalayan Landscape, Nepal

### 3.1 Introduction and background

The ISSC-MAP is being piloted in Kangchanjunga Conservation Area (KCA), a biodiversity hotspot of Sacred Himalayan Landscape (SHL), Nepal since 2007. The Himalayas are a rich repository of flora with a large number of native plants and high value non-timber forest products (NTFPs), mainly the medicinal and aromatic plants (MAPs). The high topographic complexity and related climatic variability of the Sacred Himalayan Landscape has given rise to significant ecological gradients, and thus, high ecosystem diversity over a relatively small area and due attention for conservation of these natural resources. The SHL is a trans-boundary conservation area covering 39,021 km2 across Nepal, India and Bhutan. Its vision is a Himalayan landscape where the biological and cultural treasures of the world's highest sacred mountains and deepest valleys are safeguarded while traditional rights over sustainable resources are ensured and livelihoods of mountain people are enhanced. In Nepal, the Sacred Himalayan Landscape extends from Langtang National Park in central Nepal through the Kangchenjunga Conservation Area in the east (Map 1). WWF Nepal in collaboration with Department of National Park and Wildlife Conservation implements conservation initiatives in Langtang National Park and Buffer Zone, Sagarmatha National Park and Buffer Zone and Kangchenjunga Conservation Area.




Map 1 – Nepal indicating SHL

In Nepal, the Sacred Himalayan Landscape harbors numbers important flora such as oaks (*Castanopsis* and *Quercus*), Rhododendron (*Rhododendron* sps.) and Himalayan Larch (*Larix griffithiana*); globally threatened fauna such as snow leopard (*Uncia uncia*), red panda (*Ailurus fulgens*) and musk deer (*Moschus chrysogaster*), and highly important NTFPs/MAPs such as Gentian (Kutki - *Neopicrorhiza scrophulariiflora),* Orchid (Panchaule - *Dactylorhiza hatagirea),* Indian Valerian (Sugandhawal - *Valeriana jatamansi),* Anthopogon (Sunpati - *Rhododendron anthopogon),* Nepal Pepper (Timur - *Zanthoxylum* armatum), Spikenard (Jatamansi - *Nardostachys grandiflora),* Chiraito - *Swertia chirayita,* Aconite (Bikhma - *Aconitum bisma), etc.*

The role of NTFP is particularly important in the Himalayan region, where a large proportion of the rural population depend on them as sources of food, nutrition, fodder, fiber, medicine, condiment, dye, and other useful materials. In addition, the collection and marketing of NTFP is a major source of rural income and an important source of revenue to the government. NTFPs have high socio-cultural, symbolic and idealistic values (Hamilton 2004). In the mountains of Nepal, 10 to 100% of households in rural areas are involved in commercial collection of NTFPs, and in certain rural areas, this provides up to 50% of the family income (Chhetry 1999; Edwards 1996; Olsen & Helles 1997; Olsen & Larsen 2003, cited by Oli and Nepal 2003). There are about 6500 species of flowering and 4064 species of non-flowering plants in Nepal (DPR 2001, 2002). Among these, over 2000 species are known to be potentially useful species (which are mainly used to harvest non-timber forest products - NTFP), including about 700 species of medicinal plants. The collection of NTFPs including medicinal plants for trade is an important aspect of local culture in many mountain districts of Nepal. Total number of NTFP involved in trade within or from Nepal is not well known, as many products are involved in trade through illegal channels.

In the recent years, the use of many NTFPs has gone from subsistence collection to large-scale commercial extraction resulting into over-harvesting and degradation of biodiversity, quality and availability of many valuable species, ultimately affecting the primary collectors who depend heavily on them to meet their basic needs. Edwards (1996) estimated the annual export value of raw NTFPs to be US$ 8.6 million, involving 10-15 thousand tons, from 100 species. Recently, Subedi (2006) estimated the total export value of NTFP (involving 161 species) from Nepal to be US$ 35 million. Olsen (2005) reported that some five high-value products constitute over 50% of the volume and value in trade, which has led inexorably to greater pressure on selected species. Cultivation of NTFP is still at the trial stage; thus almost all of the species involved in trade are harvested from the wild (Aumeeruddy-Thomas & Karki 2005). There is a lack of precise scientific knowledge regarding both ecological and social aspects of the resource base and potential for sustainable harvest. Depletion of many NTFP has also been attributed to the lack of proper institutional arrangements, including the lack of comprehensive policies and regulations for sustainable

collection, use, trade and management (Olsen & Helles 1997; Pandit & Thapa 2003).

Therefore, there is a need to address the sustainable harvesting issues of NTFPs/MAPs in mountains of Nepal for their long-term availability and sustainable management. Though conservation agencies are addressing the issue of sustainable production of NTFP, there are a number of challenges to be met, some of which include the disappearing forest cover, inequitable market access of marginalized populations and the monopoly of high – value NTFP by logging and poaching mafia.

In particular, Kangchenjunga Conservation Area (KCA) in Nepal Himalaya is a repository of over 200 species of plant-based NTFPs, including some high value species, such as *Dactylorhiza hatagirea, Nardostachys grandiflora, Neopicrorhiza scrophulariiflora*, *Daphne* spp. and *Swertia chirayita* (Ghimire and Nepal 2007). Some of these species are threatened by over-harvesting due to trade pressure. As the government-based centralized management system is not effectively enforced in the remote hilly districts of Nepal, the long-term sustainability of harvest of NTFP in the area largely depends on local people's knowledge and their management ability. Therefore, there is a need to strengthen community management of NTFP and link between conservation and livelihoods. In fact, communities living in the Kangchenjunga Conservation Area are historically managing their resources far before the establishment of the conservation area. The richness of traditional knowledge systems and experience in community involvement in the management of resources form a good background in this area for developing community based management system of NTFP, which address issues of biodiversity conservation as well as the promotion of local economic sufficiency. Support to such community level conservation efforts would help to preserve resources as an integral part of their socio-cultural landscape.

## 3.2 Intervention framework and approach

The major intervention approach of this initiative is: community centered and resource focused. For the purpose, Conservation Community Forests User Group is the entry point for the pilot implementation of the project. WWF is providing all the technical assistance regarding the implementation. Kangchenjunga Conservation Area Management Council (KCAMC), an apex body of the community representative in KCA, is the main local partner for this project at conservation area level. Local and district level traders are being oriented on the responsible business practices and thus will be the core implementing partners through out the project period and beyond. At district level, the Taplejung Chamber of Commerce and Industry (TCCI), District Forest Office (DFO), District Development Committee (DDC) and concerned line agencies and I/NGOs are partners.

The following figure gives an overview of five (5) basic steps needed to design and carry out a resource assessment, management planning, and monitoring process that meets the requirements of the ISSC-MAP, and uses participatory and adaptive management approaches (Figure 2).

Step 1: Situation analysis to gather and evaluate existing knowledge about target or candidate species and the collection situation;

Step 2: Base-line inventory to understand how much of the target/selected species is present within the collection area;

Step 3: Yield and regeneration studies to understand how much of the desired raw material / plant part(s) the target species produces under natural conditions, the time required for seedlings to replace harvested individual plants and size-classes, and how productivity and regeneration vary across the collection / management area;

Step 4: Assessment of harvest impacts to determine whether current harvest levels and controls are resulting in adequate resource regeneration and productivity; and

Step 5: Periodic monitoring and harvest adjustments to revise the harvest protocol if the intensity, frequency, timing, and methods of harvest are not sustainable.

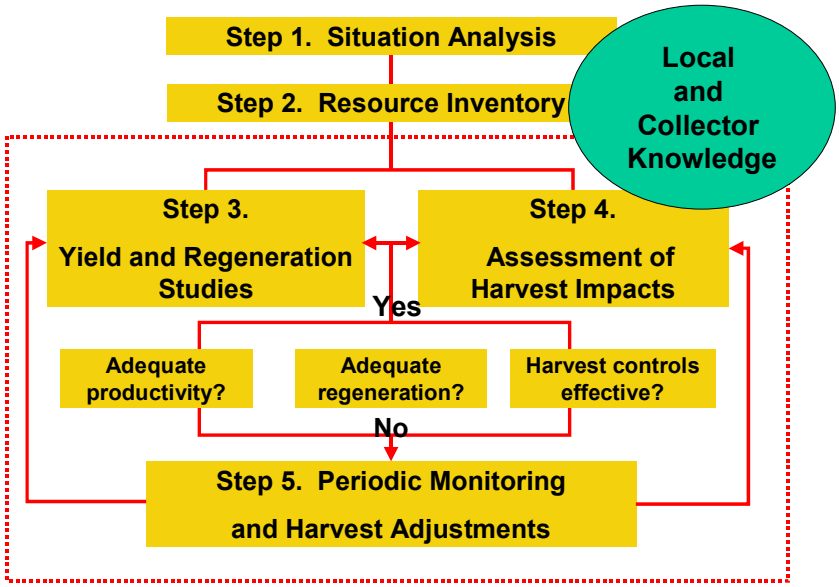



**Figure 2: Intervention framework for ISSC-MAP within an adaptive management process (Danna et al. 2008)**

Hence, the step-wise approach can be summarized as below:

- Situation analysis and pilot species and site selection with local stakeholders/target group involvement
- Translation of ISSC-MAP contents into local context
- Interim management decisions and collection protocols leading to regular resource assessments and monitoring
- Training and capacity building
- Development of a management plan and periodic review

## 3.3 Initial results and progress

The ISSC-MAP implementation in KCA is in its early stage, though some initial progress has been observed. Situation analysis of the overall context of the conservation area was carried out through review of literatures, consultations, and field observations in view of NTFP trade and economy, and conservation status and biodiversity threats. The selection of pilot speices was completed, and a number of orientation meetings and workshops were organized at community to national levels. The initial results and progress are briefly given below.

**a) NTFP trade and economy**

Among the NTFP listed from KCA, more than 16 species are largely involved in trade either locally as a bartered system with the cash crop or exported to the district headquarters, large cities of Terai, or even to foreign countries (see Table 1). These trade channels sometimes may be illegal, and the products are mainly exported in crude form from the collection sites (especially from high mountain pastures of KCA) to the Tibet or Sikkim (India) (Sherpa 2001; Oli & Nepal 2003). The total trade amount of NTFP and their values are given in Table 2. Amongst the traded species, chirayito (*Swertia chirayita*) is a single species that shares much contribution in terms of economy after the agro-forestry product, cardamom.

**Table 1** List of NTFP traded from KCA and their trade sites

| Local name | Botanical name | Parts use | Trade sites |
|---|---|---|---|
| Argeli | *Edgeworthia gardneri* | Bk | Locally processed and the final product exported to Kathmandu |
| Bikh | *Aconitum spicatum* | Rt | Yamphudin sector-Sikkim |
| Bikhma | *Aconitum bisma* | Rt | Yamphudin, Yangma, Gola, Ghunsa-Taplejung bazaar |
| Chirayito | *Swertia chirayita* | Wp | Lower belt of KCA to W. Gola, Tibet, Taplejung, Birtamod, India |
| Dhupi | *Juniperus indica.* | Lf, Ts | Yangma, W. Gola, Ghunsa-Taplejung bazzar |
| Jatamansi | *Nardostachys grandiflora* | Rh | W. Gola/Yangma-Tibet/India |
| Khokkim | *Rheum australe* | Rt | Yangma, W. Gola, Ghunsa-Taplejung bazzar |
| Kutki | *Neopicrorhiza scrophulariiflora* | Rt | W. Gola/Yangma-Tibet; Yamphudin-Sikkim |
| Baruwa | *Daphne bholua* | Bk | Yamphudin-Khebang, Mamangkhe; W. Gola, |

| | | | |
|---|---|---|---|
| (Seto lokta) | | | Lelep, Tapethok-Lelep (for the processing in paper factory) |
| Dangma (Kalo lokta) | *Daphne papyracea.* | Bk | Yamphudin-Khebang, Mamangkhe; W. Gola, Lelep, Tapethok-Lelep (for the processing in paper factory) |
| Lwasimo | Mushroom | Wp | Yangma-Lower belt of KCA (Bartered with food stuff) |
| Maikopila | *Saussurea* sp. | Fl | Yangma/Gola-Tibet |
| Majitho | Rubia manjith | Rt, St | Lower belt of KCA-Upper belt of KCA like Gola, Yangma, Phale and Ghunsa mainly used as dye; Yamphudin-Tharpu-Terai-India |
| Okhar | *Juglans regia* | Fr, Bk | Lower belt of KCA-Gola, Yangma, Phale and Ghunsa (used as a dye |
| Panchaun le | *Dactylorhiza hatagirea* | Rt | W.Gola/Yangma-Tibet; Upper Yamphudin-Sikkim (India), W. Gola/Yangma-Taplejung bazzar |
| Sunpati | *Rhododendron anthopogon* | Lf, Ts | Yangma, W. Gola, Ghunsa/Gyabla-Taplejung bazzar |

Fl- Flower, Lf- Leaf, Rt- Root, Rh- Rhizome, Wp- Whole plant, St- Stem, Bk- Bark, Ts- Tender shoot

More than 135 metric tons of NTFP, including *Amomum subulatum* (cardamom), are being harvested and traded from KCA (Table 2). Cardamom and chirayito together constitute almost 76% of the total volume of NTFP traded from KCA (cardamom's only contribution is nearly 61% of the total volume and has been under cultivation since decades long) (Oli & Nepal 2003). About 21 metric tons of chirayito (15% of the total amount) is harvested both from private and government-owned forests. Similarly, kutki and maikopila, major high altitude NTFP, comprise 14% of the total NTFP collected and traded from KCA. Species such as *Juniperus indica*, *Juglans regia* and *Rhododendron anthopogon* are collected and bartered with the cereal crops, like millet, maize etc. (grown in the lower belt of KCA).

**Table 2** Total approximate trade amounts of NTFP and their trade values

| Local Name | Botanical Name | Percentage cover | Trade amount (kg) | Price NRs per kg | Total value (NRs) | Remarks |
|---|---|---|---|---|---|---|
| Alainchi | *Amomum subulatum* | 60.66 | 82,000 | 212 | 1,73,84,000 | - |
| Argeli | *Edgeworthia gardneri* | 3.70 | 5,000 | 20 | 1,00,000 | - |
| Bikh | *Aconitum spicatum* | 0.24 | 320 | 200- 300 | 80,000 | About 10 mons of bikh is exported by Sikkimese from upper belt of Yamphudin VDC |
| Bikhma | *Aconitum bisma* | 0.07 | 100 | 400 to 600 | 50,000 | Traded to Taplejung, Tibet and Sikkim |
| Chirayito | *Swertia chirayita* | 15.39 | 20,800 | 125-150 (W. Gola), 88 | 23,45,200 | Tax ranges from Rs. 50/mon (Hellok); Rs. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | (Taplejung ) | | 200/mon (Lelep) |
| Dhupi | *Juniperus indica* | 0.30 | 400 | 30 | 12,000 | - |
| Khokkim | *Rheum australe* | 0.15 | 200 | 100 | 20,000 | Traded to Taplejung |
| Kutki | *Neopicrorhiza scrophulariiflora* | 8.73 | 11,800 | 150- 200 (dry) 30-50 (wet) | 4,72,000 | About 1200 mons of kutki is harvested and stolen by Tibetan and Sikkimese from KCA |
| Lokta | *Daphne* spp. | 5.18 | 7,000 | 25 | 1,75,000 | Around 2,00,000 pieces of paper is produced in KCA and its surrounding consuming 90% of the raw material |
| Maikopila | *Saussurea* sp. | 5.18 | 7,000 | 40-50 (dry), 6-10 (wet) | 48,000 | About 800 Mons of makopila is exported by Tibetan & Sikkimese |
| Okhar (Exocarp) | *Juglans regia* | 0.03 | 40 | 40 | 1600 | Consumed at W. Gola, Ghunsa, Pholey |
| Panchaunle | *Dactylorhiza hatagirea* | 0.02 | 30 | NA | NA | Exported to Tibet and Sikkim |
| Sunpati | *Rhododendron anthopogon* | 0.37 | 500 | 40 | 20,000 | Also collected by Sikkimese |
| **Total** | | **100** | **135,190** | | **20,707,800** | |

**b) Conservation status**

Altogether, 22 species of useful plants that occur in KCA have been cited under various national and international conservation or threat categories (Table 3). Nine NTFP species found in KCA have been cited under IUCN threat category as rare (*Rheum nobile*), threatened (*Aconitum spicatum*, *Bergenia ciliata* and *Dioscorea deltoidea*) and vulnerable. Likewise, *Dactylorhiza hatagirea*, *Neopicrorhiza scrophulariiflora* and *Podophyllum hexandrum* are included in CITES Appendix II. *Dactylorhiza hatagirea* and *Juglans regia* are among those species which are banned by the Government of Nepal for collection under the category 1, whereas other four species found in KCA, fall under category 2 (ban for export outside the country without processing). Based on the field study, a qualitative evaluation of the availability and local status of potential NTFP of KCA was made (Table 3). Many species listed in Table 3 are not locally threatened. The result showed that 16 NTFP species are threatened in KCA by natural (3 species), anthropogenic (5 species) and by both (8 species) of these factors. Besides, some species have unique biological features that are responsible for

the rarity of these species in the nature. Such species are more vulnerable to natural forces as well as human pressures.

**Table 3** List of NTFP of KCA and their conservation status

| Species | Family | IUCN | CAMP | GN | CITES | Availability in KCA | Local status |
|---|---|---|---|---|---|---|---|
| *Abies spectabilis* | Pinaceae | | | 2 | | A | NT |
| *Aconitum spicatum* | Ranunculaceae | T | VU | | | R | $T^{n}$ |
| *Aconitum bisma* | Ranunculaceae | | DD | | | R | $T^{a,n}$ |
| *Asparagus racemosus* | Liliaceae | | VU | | | - | - |
| *Bergenia ciliata* | Saxifragaceae | T | | | | C | NT |
| *Dactylorhiza hatagirea* | Orchidaceae | | EN | 1 | A II | R | $T^{n,a}$ |
| *Daphne bholua* | Thymelaeaceae | | | | | C | $T^{a}$ |
| *Daphne papyracea* | Thymelaeaceae | | | | | C | $T^{a}$ |
| *Dioscorea deltoidea* | Dioscoreaceae | T | EN | | | - | - |
| *Fritillaria cirrhosa* | Liliaceae | | VU | | | C | NT |
| *Juglans regia* | Junglandaceae | | | 1 | | - | - |
| *Michelia champaca* | Magnoliaceae | | CR | | | R | $T^{a}$ |
| *Nardostachys grandiflora* | Valerianaceae | VU | VU | 2 | | R | $T^{n,a}$ |
| *Neopicrorhiza scrophulariiflora* | Scrophulariaceae | VU | VU | 2 | A II | C | $T^{a}$ |
| *Paris polyphylla* | Liliaceae | VU | VU | | | R | $T^{n,a}$ |
| *Podophyllum hexandrum* | Berberidaceae | VU | VU | | A II | R | $T^{n}$ |
| *Rheum australe* | Polygonaceae | | VU | | | C | NT |
| *Rheum nobile* | Polygonaceae | R | VU | | | R | $T^{n,a}$ |
| *Rubia manjith* | Rubiaceae | | VU | | | A | NT |
| *Saussurea gossypiphora* | Compositae | | | | | R | $T^{n,a}$ |
| *Saussurea topkegolensis* | Compositae | | | | | R | $T^{n,a}$ |
| *Saussurea tridactyla* | Compositae | | | | | R | $T^{n,a}$ |
| *Swertia angustifolia* | Gentianaceae | | EN | | | C | NT |
| *Swertia chirayita* | Gentianaceae | VU | VU | | | C | $T^{a}$ |
| *Swertia multicaulis* | Gentianaceae | | DD | | | C | NT |
| *Taxus wallichiana* | Taxaceae | | EN | 2 | A II | C | NT |
| *Valeriana jatamansi* | Valerianaceae | | VU | 2 | | R | $T^{n}$ |

**Abbreviations**:
IUCN (Shrestha and Joshi 1996): T = Threatened, VU = Vulnerable, R = Rare
CAMP (Conservation Assessment Management Planning Workshop, 2001): EN = Endangered, DD = Data deficient, CR = Critical, VU = Vulnerable

GN (Government of Nepal, based on Forest Act 1992 and Forest Regulation 1995): 1 = banned for collection, 2 = ban for export outside the country without processing
CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora): A II = Appendix II
Availability: A = abundant, C = common, R = rare
Local status: NT = not threatened, T = Threatened [super script letters represent anthropogenic (abbreviated as 'a') and natural (abbreviated as 'n') factors responsible for the threat to the species]

The natural factors mainly comprise small population size, strong geographical isolation and harsh environmental conditions. *Dactylorhiza hatagirea, Nardostachys grandiflora, Rheum nobile,* and *Saussurea* spp. are threatened not only due to human pressure but also because they are naturally very rare. They show high habitat specificity. Except *D. hatagirea* (which grows in meadows at lower altitudes <4300 m), all the three species are found in harsh xeric habitats, such as rocky slopes and rock outcrops at very high altitude (>4000 m to up to 5500 m). *D. hatagirea* and *Saussurea* spp. are commercially exploited, but the other two species are locally used.

Among the other species, increasing demand of *Swertia chirayita, Neopicrorhiza scrophulariiflora* and *Saussurea* sp. from Tibetan and Indian markets have created extreme pressure on wild populations of these herbs. Although, *S. chirayita* (chirayito) is largely cultivated in private land, it is still threatened in the wild. The collection and sale of *N. scrophulariiflora* and *Saussurea* sp. mainly occur in the upper Himalayan region at the boarder of KCA with Tibet (Walangchung Gola and Yangma) and Sikkim (upper belt of Yamphudin). Local people, herders and cross-border communities are actively involved in the collection and trade of these high-value NTFP. Haphazard collection of these herbs even before they produce seeds (July/August) is one of the major issues for their long-term sustainability. Likewise, bark of lokta (*Daphne* spp.) is collected from all the four VDCs of KCA to make Nepali hand made paper in the locally established paper factories in Lelep and Yamphudin. These plants are also over exploited in some forests, threatening to the long-term persistence of their populations.

**c) Pilot species and site selection**

Kutki (*Neopicrorhiza scrophulariiflora*) was selected as a pilot speices for ISSC-MAP implementation in KCA (Annex 1). Similarly, Walangchung Gola sector of KCA was selected as implementing site of the project where Kutki is commonly available and posing continuous threats brought about by the high market demand, unsustainable and destructive harvesting of its rhizome from its natural habitat for international trade, as compared to other species (refer map 1). Also, some works have already been initiated for kutki such as resource inventory, identification of its total natural and harvestable stock in the community forests and action plan preparation work in order to promote its wild harvesting.

Based on the past studies and recently conducted inventory of kutki in some of the community forests in KCA, it is revealed that this species is commonly

available in the high pastures and alpine meadows, and community can be benefited through its sustainable management and harvesting from the wild. Moreover, the ban of this species has also been lifted by the government of Nepal, the wild harvest and sale of which is allowed only after its taxonomic identification and confirmation of the species as *Neopicrorhiza scrophulariiflora* by Department of Plant Resources and final approval of Departent of Forests on the basis of its inventory and after identification of its total natural and harvestable stock in the wild. *Neopicrorhiza scrophulariiflora* is closely related to *Picrorhiza kurrooa Royle*, the latter species being included in CITES appendix II.

Photo: Consultation with local stakeholders for species selection in KCA (*Date: Dec 19, 2007; photo by Indu*)

Both *Neopicrorhiza scrophulariiflora* and *Picrorhiza kurrooa* are traded under the same name (kutki). Today, the bulk of international trade in kutki has been said to mainly represent air-dried rhizomes of *Neopicrorhiza scrophulariiflora* originating from Nepal.

## 4. Key challenges

As reflected in various consultations and review, there are many challenges to meet in applying a standard set of principles and good practices leading to support of sustainable wild collection of MAP resources. These challenges include:

- Circumstances of ecology, habitat, and pressures on resources are unique for each species, requiring management plans that are specific to each MAP collection operation and area.

• The dependence of local communities on MAP resources for health and livelihood security is largely unassessed and unrecorded.

• Little research on harvesting techniques has been directed toward understanding how to collect wild MAP species sustainably.

• Maximum quotas for wild-collection of MAP species are often based on overly simple and untested assumptions about the relationship between available supply and regeneration of MAP resources.

• Products, uses, and markets based on MAP species are numerous and diverse, with similarly numerous and diverse entry points for practices supporting sustainable use.

• There is a wide proliferation of labels and claims, such as organic and fair trade, which imply but do not provide a means of verifying sustainable wild collection.

• Long and complex source-to-market supply chains make tracing a product back to its source extremely difficult.

## 5. Future prospects, up-scaling, and conclusion

The adaptation of the standard requires several steps to go ahead. To further advance ISSC-MAP implementation, now is the step for resources assessment to determine the conservation status, trade volumes and sustainable use thresholds in the target area, with the long-term objective to scale up this activity using the methodology developed during the pilot phase. In the past, the Government of Nepal and WWF Nepal have been jointly implementing projects on sustainable management of NTFPs /MAPs in KCA through financial support from WWF-UK, WWF-US/MacArthur Foundation and Darwin Initiative/WWF-UK. The ISSC-MAP project is to build on the results and achievements of the previous MAP projects in the area. It will focus on adapting the structures of the community-based management system of KCA to meet ISSC-MAP principles and criteria. To achieve this aim, the management plan will be harmonized with existing guidelines and the ISSC-MAP indicators will be adapted to the local conditions.

The local communities will be facilitated to increase their access to markets so that the inefficient economic role will be transformed by value-added activities in the local areas. The purpose of these activities will be to shorten the existing chain by removing the multiple layers of middleman and traders and link local producing and processing directly to more lucrative markets. Since redefining of the production to consumption and marketing (PCM) chain will face stiff competition from the traditionally established market channels and forces, the new chain will have to be based on recognized comparative advantages for their survival.

**Box 1: Who would benefit from this initiative?**

Industry → sustainable resource use and corporate social and environmental responsibility
Resource managers → guidelines for MAP protection, harvest, and monitoring
Collectors → insurance against resource and market failures
Consumers → reliability of claims about ecological sustainability and fair trade
Species and habitats → maintain biodiversity

Further, the implementation of this project can help to strengthen collection and marketing strategy of commercial wild NTFPs/MAPs of KCA and other parts of Nepal Himalaya in the context of increasingly competitive international / global marketing thus leading to good marketing management in terms of capacity development of local communities / collectors and traders for ensuring timely and regular supply of high quality products at competitive price. Already, this process has been started to the buffer zone communities of Langtang National Park, the west part of Sacred Himalayan Landscape; and Dabur Nepal, a business company has already indicated an interest to promote this initiative. The project will continue to work with the government, private sector, and other stakeholders to contribute to creating enabling environment for fair trade and marketing of NTFPs.

In conclusion, with the implementation of ISSC-MAP in KCA, a model initiative towards the sustainable use of medicinal plants will be available, providing concrete examples of the role of local decision making processes in resource and habitat conservation and delivering increased economic benefits from this use. Appropriate guidance documents and other related material supporting the implementation of ISSC-MAP will be available for general application. ISSC-MAP based management plan will be developed and documented. Strategic partnerships will be developed at the regional and international levels among industry, certifiers, government and producer communities that support market access for sustainably and ethically produced products.

With this pilot initiative, it is found that the local communities, KCA management council members, local chamber members, community forestry federations, and district stakeholders have shown much interest on the standard, its potential impacts on conservation and livelihoods, and are enthusiastic on the process.

**References**

Aumeeruddy-Thomas Y. & Karki M. 2005. *Himalayan medicinal and aromatic plants: perspectives for balancing use and conservation*. In: Himalayan Medicinal and Aromatic Plants, Balancing Use and Conservation (Y. Aumeeruddy-Thomas, M. Karki, D. Parajuli & K. Gurung, eds.), pp. 2-37.

WWF-UNESCO People and Plants Initiative/WWF Nepal Program/IDRC, Kathmandu, Nepal.

BfN Skripten 195. 2007. *International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP) - Version 1.0*. Medicinal Plant Specialist Group; Species Survival Commission and IUCN, The World Conservation Union.

Chhetry D.B. 1999. *Diversity of Medicinal and Aromatic Plants in Manang, Central Nepal with Emphasis on Ecology and Essential Oil Variation of Jatamansi (Natdostachys grandiflora DC.).* M.Sc. Dissertation. Central Department of Botany, Tribhuvan University, Kathmandu, Nepal.

Leaman, D. J. and Cunningham, A.B. (Tony). 2008. *Guidance for Implementing the International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP).* IUCN-SSC Medicinal Plant Specialist Group/ ISSC-MAP secretariat, WWF Germany/TRAFFIC.

DPR. 2001. *Flowering Plants of Nepal (Phanerogams*). Government of Nepal, Ministry of Forests and Soil Conservation, Kathmandu, Nepal.

DPR. 2002. *Pteridophytes of Nepal. Government of Nepal*, Ministry of Forests and Soil Conservation, Kathmandu, Nepal.

Edwards D.M. 1996. *The trade in non-timber forest products from Nepal*. Mountain Research and Development, 16: 383-394.

Ghimire, S.K. & Nepal B.K. 2007. *Developing a Community-Based Monitoring System and Sustainable Harvesting Guidelines for Non-Timber Forest Products (NTFP) in Kangchenjunga Conservation Area (KCA), East Nepal*. Final Report submitted to WWF Nepal Program, Baluwatar, Kathmandu, Nepal.

Hamilton A.C. 2004. *Medicinal plants, conservation and livelihoods*. Biodiversity and Conservation, 13: 1477-1517.

LANGE, D. and U. SCHIPPANN. 1997. *Trade Survey of Medicinal Plants in Germany: A contribution to International Plant Species Conversation*. Bundesamt fur Naturschutz, Bonn

SCHIPPMANN, U, D. LEAMAN, and A.B.CUNNINGHAM. 2006. Cultivation and wild collection of medicinal and aromatic plants under sustainability aspects. *In*: Bogers,R.J. , L.E Craker, and D.Lange (eds). *Medicinal and aromatic plants*. Springer ,Dordrecht. Wageningen UR Frontis Series no.17. (http://library.wur.nl/frontis/medicinal_ aromatic_plants/05_schipmann.pdf)

SRIVASTAVA, J., J. LAMBERT , and N. VIETMEYER.1996. *Medicinal plants: An Expanding Role in Development*. World Bank Technical Paper 320.World Bank, Washington, D.C.

WHO- World Health Organization. 2003. *WHO Guidelines on Good Agricultural and collection practices (GACP) for medicinal Plants*. WHO, Geneva.

XIAO PEN-GEN. 1991. The Chinese Approach to Medicinal plants – Their Utilization and conservation. In: Akerle, O., V .Heywood, and H. Synge (eds.).*Conservation of Medicinal Plants*. Cambridge University Press, Cambridge,UK.

## ANNEX 1: SPECIES SELECTION FOR ISSC-MAP PILOTING

Kutki (*Neopicrorhiza scrophulariiflora*) is selected as appropriate species for ISSC-MAP implementation in Kagnchenjunga Conservation Area (KCA), as recommended by the community meetings, district workshop, consultation with local traders in KCA, analysis of pre-assessment matrix (see below Table 1) with key local informants, and also review of past studies carried out so far. The community workshop agreed on initiating the project through Kutki in Walangchung Gola in KCA. Through the analysis of the matrix, it can be concluded that Kutki could be the appropriate species for ISSC-MAP pilot implementation, as this species is facing threats brought about by the high market demand, unsustainable and destructive harvesting of its rhizome from its natural habitat for international trade, as compared to other species. Also, certain level of works have already been initiated for Kutki such as resource inventory, identification of its total natural and harvestable stock in some of the community forests and initiation of action plan preparation work in order to initiate its wild harvesting.

**Table 1: Pre-assessment matrix**

| Condition/factor | Kutki (*Neopicrorhiza scrophulariiflora*) | Chiraito (*Swertia chirayita)* | Jatamansi *(Nardostachys grandiflora)* |
|---|---|---|---|
| **Geographic distribution** | Wide | Limited (more on cultivation) | limited |
| **Habitat specificity** | Broad (more even distribution) | very specific (patchy distribution) | very specific (patchy distribution) |
| **Local population size** | Medium to large | medium to large | always small |
| **Growth Rate** | fairly rapid | slow | slow |
| **Part of plant used** | Root/Rhizome | Whole Plant | Root/Rhizome |
| **Single Vs. Multiple Use** | Few, low conflict between uses | multiple-use species | few, low conflict between uses |
| **Reproductive biology**<br>• **Pollination**<br>• **Dispersal** | • Entomophilous (*Bombus* spp.)<br>• Wind | • Wind<br>• Wind, Water | • Wind<br>• Wind, Water |
| **Conservation status** | Collectors knowledge | Not clearly know for | Not clearly known |

| | | | |
|---|---|---|---|
| **and value** | and other indicators suggest this species is being over-exploited | wild growth | |
| **Likelihood of sustainable wild harvest** | HIGH | MEDIUM | LOW |
| **Precision, rigor required for inventory, monitoring and management** | MEDIUM | MEDIUM | MEDIUM |
| **Costs and complexity of monitoring and mgmt.** | MEDIUM | MEDIUM | HIGH |
| **Other factors that reduce cost and complexity of resource inventory, monitoring, and management** | ✓ The collection area is well defined - there are maps and GPS points as well<br>✓ There is clear taxonomic identification and reliable field recognition by collectors<br>✓ Resource derived from single species<br>✓ The extraction and management history of the collection area is known<br>✓ The collection operations in the collection area are currently not participating in the resource assessment and management (but in the process)<br>✓ The inventory has been undertaken in some community forests and report is under preparation<br>✓ Traditional /local collector knowledge of the resource, collection practices exists and can be included in the resource assessment | ✓ The collection area is not well defined<br>✓ There is clear taxonomic identification and reliable field recognition by collectors<br>✓ Resource derived from single species<br>✓ The collection operations in the collection area are currently not participating in the resource assessment and management (but in the process)<br>✓ The inventory has been undertaken in a few community forests<br>✓ Traditional /local collector knowledge of the resource, collection practices exists and can be included in the resource assessment | ✓ The collection area is not completely defined - there are maps and GPS points in some cases only<br>✓ There is clear taxonomic identification and reliable field recognition by collectors<br>✓ Resource derived from single species<br>✓ The extraction and management history of the collection area is little known<br>✓ The collection operations in the collection area are currently not participating in the resource assessment and management (but in the process)<br>✓ The inventory in only one CFUG has been undertaken but final report yet to be received<br>✓ Traditional /local collector knowledge of the resource, collection practices exists and can be included in the resource assessment |

As suggested by the previous research, studies, and recently conducted inventory of Kutki in some community forests of KCA, it is revealed that this species is commonly available in the high pastures and alpine meadows, and community can be benefited through its sustainable management and harvesting from the wild. Moreover, the ban of this species has also been lifted by the government of Nepal, the wild harvest and sale of which is allowed only after the

taxonomic identification and confirmation of the species as *Neopicrorhiza schrophulariiflora* by Department of Plant Resources and final approval of Departent of Forests on the basis of its inventory and after identification of its total natural and harvestable stock in the wild. *Neopicrorhiza scrophulariiflora* is closely related to *Picrorhiza kurrooa* Royle, the latter species being included in CITES appendix II. Both *Neopicrorhiza scrophulariiflora* and *Picrorhiza kurrooa* are commercialized under the same trade name (kutki). Today, the bulk of international trade in kutki has been said to mainly represent air-dried rhizomes of *Neopicrorhiza scrophulariiflora* originating from Nepal.

The details of Kutki (*Neopicrorhiza scrophulariiflora*) and additional information on why this species is selected for ISSC-MAP pilot implementation is provided below.

## 1. General Description

***Neopicrorhiza scrophulariiflora*,** locally called by **Hunglen** (Sherpa) and commonly called as **Kutki** (Nepali) is a long-lived, rhizome-bearing, perennial herb with seasonal growth. It has long creeping woody rhizomes. It has stout, elongated, creeping rhizomes at the bases of old rosettes. Each rosette is composed of up to 20 spathulate to ovate serrate leaves with base tapering below to a winged leaf-stalk. Flowers are dark blue-purple and are produced in a dense terminal spike, borne on aerial stem arising from rosette. Fruits are ovoid capsules (6-10 mm) and are many-seeded. Seeds are minute and winged. It is native to the Himalaya and China. It is distributed from 3500 to 4800 m altitude in the Himalaya from Garhwal (Inida), Nepal to Bhutan as well as in N. Myanmar, SE Tibet and S.W. China. The plant prefers moist habitat with rich soils on north-facing slopes and is found in meadows, gravelly areas of moraine, shrublands and forests. It is found in most of the northernmost mountain districts of Nepal and Kangchenjunga conservation area is the one amongst them.

It reproduces both by sexual and vegetative means (clonal). It shows extensive vegetative growth through the production of vegetative offshoots (or ramets). The flowering takes place from June to August, and fruiting from July to August. But the flowering period varies depending upon altitude and climatic factors. The flowers are hermaphrodite (have both male and female organs). Pollination is assumed to be entomophilous (probably by *Bombus* sp.). The plant can produce up to 15 fruits per inflorescence and up to 50 seeds per fruit. Seeds are dispersed in late September, most probably by wind. Seed viability is short. Seeds germinate by May/June of the following year. In natural conditions, seedling recruitment is low. But in controlled environment (laboratory conditions), germination of seeds can take place within one week after sowing, and total germination range from 75-100% in 3-4 weeks. In natural conditions, seedlings grow into small rosettes during their first year. The growth of individual rosettes of seed origin to reproductive size may take several years.

*Neopicrorhiza scrophulariiflora* is a slow growing and long-lived plant. There are both sexual and vegetative stages in its life cycle. It exhibits clonal growth by producing long rhizomes from the bases of old rosettes, establishing new rosettes at some distance from the mother plant. Plants growing from seeds take more than 5 years to become mature. But, plants regenerated from vegetative shoots could attain maturity stage after 2-3 years. The key environment factors for its growth are substrate moisture and nutrient contents. In rocky habitats, its growth is very slow whereas in meadow and forest habitats, plant growth is faster.

## 2. Conservation status of Kutki

*Neopicrorhiza scrophulariiflora* is also a highly threatened species in the Himalaya due to unsustainable harvesting of its rhizome for international trade. It has vulnerable status in Nepal. *Neopicrorhiza scrophulariiflora* is closely related to *Picrorhiza kurrooa* Royle, the latter species being included in CITES appendix II. Both *Neopicrorhiza scrophulariiflora* and *Picrorhiza kurrooa* are commercialized under the same trade name (kutki). Today, the bulk of international trade in kutki has been said to mainly represent air-dried rhizomes of *Neopicrorhiza scrophulariiflora* originating from Nepal. *Neopicrorhiza scrophulariiflora* has been incorporated in the protection list of Government of Nepal under category 1 (banned for collection, use, sale, distribution, transportation and export). Although banned by the government, large amount of rhizomes of *Neopicrorhiza scrophulariiflora* are still traded without control.

***Conservation status of Kutki at different category***

| Species | Family | IUCN | CAMP | GN | CITES | Local status |
|---|---|---|---|---|---|---|
| *Neopicrorhiza scrophulariiflora* | Scrophulariaceae | VU | VU | 2 | A II | $T^a$ |

**Abbreviations**:
IUCN (Shrestha and Joshi 1996): T = Threatened, VU = Vulnerable, R = Rare
CAMP (Conservation Assessment Management Planning Workshop, 2001): EN = Endangered, DD = Data deficient, CR = Critical, VU = Vulnerable
GN (Government of Nepal, based on Forest Act 1992 and Forest Regulation 1995): 1 = banned for collection, 2 = ban for export outside the country without processing
CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora): A II = Appendix II
Availability: A = abundant, C = common, R = rare
Local status: NT = not threatened, T = Threatened [super script letters represent anthropogenic (abbreviated as 'a') and natural (abbreviated as 'n') factors responsible for the threat to the species]

## 3. Existing trade and trade values

Rhizomes of *Neopicrorhiza scrophulariiflora* are highly bitter and are one of the important sources of cash income for mountain people. Its rhizomes are traded in

large amount from Nepal. Rhizomes are highly valued in the Ayurvedic, Tibetan and Chinese systems of medicine. Rhizomes of *Neopicrorhiza scrophulariiflora* are considered as having carminative, stomachic, anthelmintic, purgative, depurative, cholegogue, cardiotonic, expectorant, antiperiodic and antipyretic properties. In Ayurveda, its rhizomes are used to treat disorders of the liver and upper respiratory tract, in fevers, dyspepsia, diarrhea, constipation, colic, skin diseases, inflammations, cardiac disorders, hypotension, rheumatism, diabetes and dropsy. In Tibetan medicine, the plant is used in bile, blood and lung disorders, high blood pressure, sore throat, cold and cough. Rhizomes contain cucurbitacins (triterpenic substances), iridoid glucosides (such as aucubin, picrosides, specioside, verminoside), phenylethanoid glucosides (such as scrosides and plantamajoside), and phenolic compounds.

Among the NTFP listed from KCA, more than 16 species are largely involved in trade either locally as a bartered system with the cash crop or exported to the district headquarters, large cities of Terai, or even to foreign countries. These trade channels sometimes may be illegal, and the products are mainly exported in crude form from the collection sites (especially from high mountain pastures of KCA) to the Tibet (China) or Sikkim (India) (Sherpa 2001; Oli & Nepal 2003). Amongst the traded species, chirayito (*Swertia chirayita*) is a single species that shares much contribution (15.39 % - bulk of the amount comes from cultivation) in terms of economy while Kutki (*Neopicrorhiza scrophulariiflora*) comprises of around 9% (from the wild collection). Kutki is almost sold in raw and wet form, mainly to the Tibet. Local traders in some cases dry the wet Kutki and sell it to Tibetan traders who do frequent travel to Walangchung Gola in the peak season. In some cases, the trade between Walangchug Gola trader and Tibetan traders is done through barter system, also in the case of Kutki.

The main market for Kutki at present is Tibetan market. This market channel is dominated by few traders who normally visit to Walangchung Gola, Yangma and other places in order to buy Kutki from local traders. In some cases, the local traders go to the Tibetan border and sell in the market. Though the Tibetan market has been like a mystery for all, it is found that the market segmentation for the present trade of Kutki single downs to the retail shops in Tibet (selling medicinal plants/herbs and NTFPs). However, the market segmentation for pharmaceutical uses and other industrial buyers are unexplored.

Besides, there is demand of Kutki from Ayurvedic industries in Kathmandu and other places. However, due to its less supply (no proper supply chain) and also legal problems (processes and criteria need to meet) that prevailed year back, Kutki trade has not been yet streamlined.

**4. Harvesting sustainability**

*Neopicrorhiza scrophulariiflora* is comparatively less sensitive to harvesting of rhizomes as compared to *Nardostachys grandiflora* and *Swertia chirayita*. It can

recover faster after harvesting due to its high capacity of vegetative growth. However, this species is also vulnerable if very high harvesting intensity is applied. Rhizome harvesting should be done selectively from matured plants. The sustainable rate of harvest for this species has been estimated to be less than 40% with a minimum rotation period of three years. However, sustainable rates of harvesting vary according to habitat types. Since a high rate of survival and growth of replanted ramets has been reported in this species, harvesting of *Neopicrorhiza scrophulariiflora* should follow a combination of selective collection of matured rhizomes and replanting of the younger ones *in situ*. Harvesting should be undertaken at the end of growing season (after seed maturation) when the above ground plant dries up. But the current harvesting practice does not follow the sustainable harvesting techniques. Immature and unsustainable harvesting of Kutki is prevalent i.e. before the dispersal of the seed. Collection is done in such a way that no any mother seeds/rhizome/root is left in its habitat, i.e. in a very destructive way. Ideally while collecting, 20% of the root has to be left for regeneration and the thinner ones are left for full growth and the thicker ones are collected, but are not practiced locally. Kutki is normally collected in June / July before maturation and dispersal of the seed. For the collection, the CFUG provides a permit to an individual for 20-30 days period at the rate of Rs. 25 by allocating specific block for collection. The community forest user groups decide the time for the collection of Kutki and the local residence have to trek to high pastures and meadows (trip of minimum five days) for the collection of roots of Kutki. One person can collect on average 10-15 kg of Kutki per day depending upon the resources availability. Kutki is collected at the 3 years time rotation.

**References**


Ghimire, S.K. & Nepal B.K., 2007. Developing a Community-Based Monitoring System and Sustainable Harvesting Guidelines for Non-Timber Forest Products (NTFP) in Kangchenjunga Conservation Area (KCA), East Nepal. Final Report submitted to WWF Nepal Program, Baluwatar, Kathmandu, Nepal.

Pyakurel, D., 2007. Enterprise Development and Market Linkage Based on Non Timber Forest Products (NTFPs) of Kangchenjunga Conservation Area (KCA). Final Report Submitted to Kangchenjunga Conservation Area Project (KCAP).

Lotus Opportunities, 2006. Subsector Analysis for Non Timber Forest Products (NTFPs) and Sustainable Intervention Strategy in KCAP Area. Final Report Submitted to WWF/ KCAP, Nepal by Lotus Opportunities Pvt. Ltd. G.P.O. Box: 3459, Kathmandu.

Oli B.R. & Nepal B.K., 2003. *Non-timber Forest Products from the Kangchenjunga Conservation Area: Aspects of Trade and Market Opportunities*. WWF Nepal Program, Kathmandu, Nepal.

Sherpa S., 2001. *The High Altitude Ethnobotany of the Walung people of Walangchung Gola, Kangchenjunga Conservation Area, East Nepal*. M.Sc.

Thesis, Central Department of Botany, Tribhuvan University, Kirtipur, Kathmandu, Nepal.
Shrestha K.K. & Ghimire S.K., 1997. *Diversity, Ethnobotany and Conservation Strategy of Some Potential Medicinal and Aromatic Pants of Taplejung (Tamur Valley).* Final Report, submitted to Asia Network for Small scale Agricultural Bioresources (ANSAB) Kathmandu, Nepal
Shrestha K.K. & Ghimire S.K., 1996a. *Plant Diversity Inventory of the Proposed Kangchenjunga Conservation Area (Ghunsa and Simbua valley)*. Report Series No. 22. WWF Nepal Program, Kathmandu, Nepal.
Shrestha K.K. & Ghimire S.K., 1996b. *Diversity, Ethnobotany and Conservation Strategy of Some Potential Medicinal and Aromatic Plants of Taplejung (Tamur Valley)*. Report submitted to Asia Network for Small scale Agricultural Bioresources (ANSAB), Kathmandu, Nepal.
Shrestha, K.K., 1994. Floristic diversity, vegetation and ethnobotany of the proposed Kangchenjunga Conservation Area. Report Series No. 6. WWF Nepal Programme, Kathmandu, Nepal.