VALUE CHAIN DESIGNING OF

# Chiraito

OF PANCHASE PROTECTED FOREST AREA


Implementing Agency

Ministry of Forest and Soil Conservation, Department of Forests

Implementing Partners

IUCN UNEP UNDP

Supported by

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

***Technical Support & Study by:***

Biodiversity Associates for Research, Development & Action Nepal (BARDAN)

***Published by:***

This report has been published under 'Ecosystem based Adaptation (EbA) in mountain Ecosystem in Nepal Project, jointly implemented by Department of Forest under Ministry of Forests and Soil Conservation (MFSC) as a lead agency for implementation at the national level in partnership with IUCN, UNEP and UNDP. Ministry of Science Technology and Environment, (MoSTE) plays an overall coordination role. The EbA programme is funded by the Germany's Federal Ministry for the Environment, Nature conservation and Nuclear Safety (BMU)

***Available:***

**Ecosystem based Adaptation (EbA) in Mountain in Nepal**

Project Management Unit

Forestry Complex. P.O. Box. 24417

Tel: 01-4218458 Fax. 01-4225553

Email: info@eba.org.np

Web: www.dof.gov.np/eba

# Chiraito

## Introduction

Chiraito [Botanical name- *Swertia chirayita* (Roxb. ex Fleming) Karsten; English- Chireeta; Family- Gentianaceae], also known as Tite/ Pothi Chiraito/ Tikta is a perennial herb of temperate regions of Nepal. Chiraito is one of the highest export revenue earning medicinal plants of Nepal. Apart from the collection from wild, it is now cultivated in most of the eastern districts of Nepal.

## Habit (Characteristics)

Chiraito is a biennial or perennial herb with seasonal growth. It mostly has a single stout elongated stem, size of which ranged from 60cm to 150cm with branching at tip. Colour of stem is greenish brown at young and turns light brown to light violet as the plant attains maturity. Stem is cylindrical at base, quadrangular upwards. Roots are generally small, 5-10cm long, light brown, somewhat twisted and gradually tapering, bearing a few rootlets or their remnants. Leaves are ovate, elliptic or broadly lanceolate, sessile, opposite, acute, 3-5 nerved, 1.6-10cm by 0.3-3cm. Leaves grown near base are often larger than that grown near tips. Flowers are greenish yellow borne in small clusters. Flowers contain numerous minute seeds. It is unable to exhibit thick stocking. Whole plant is intensely bitter in taste. Flowering takes place from July to October and fruiting from September to November (Polunin and Stainton 1984, Ghimire *et al.* 2008a, Ghimire *et al.* 2008b, Pyakurel 2008, Pyakurel and Baniya 2011).

Pictures: Three stages of Chiraito in wild habitat (all photographs by Dipesh Pyakurel)

# Habitat and Distribution

## National perspective:

Chiraito is distributed within the altitude of 1500m to 3000m throughout Nepal. Plant prefers North and North West facing moist habitat on forests, rangelands and around cultivated lands. But it is found mostly on South West facing slopes of mixed broad leaved forest. Chiraito population mainly comprised of juveniles, followed by rosette stage and adults in wild (Pyakurel 2008). Major associates of Chiraito are *Anaphalis* sp, *Desmodium* sp, *Anemone obtusiloba*, *Elsholtzia* sp, *Fragaria* sp, *Oxalis corniculata* etc (Ghimire *et al.* 2008a, Pyakurel 2008).

## Distribution of Chiraito in Panchase area:

Chiraito has been recorded from Panchase area within the altitudes of 1600m to 2300m, bulk of which is available in the core area. It is naturally available in ward no 8 and 9 of Arther Dandakanda; ward no 4, 6, 7, 8 and 9 of Bansing; ward no 1,3,7,8 and 9 of Bhadaure Tamagi; and ward no 4,5 and 7 of Chitre (Pyakurel 2005, FGDs and questionnaire to herders). However, resource assessment is mandatory for the exact quantification in those identified wards and VDCs. At the same time, it can be cultivated in upper sub-tropical and lower temperate regions of these VDCs in the abandoned farm lands and in the CFUGs.

# Uses of Chiraito

Chiraito is one of the most important medicinal plants of the mid-hills has historical, ethno-botanical, medical as well as economic values for the local communities. Chiraito is an integral part of Ayurved, Yunani, Chinese and Tibetan medication system. It is also used in herbal medication system in USA and UK (Joshi and Dhawan, 2005). Whole plant is intensely bitter in taste.

Chiraito is useful to treat more than 15 diseases, disorders & ailments locally and through Ayurvedic & Allopathic medicines. Dried plant is soaked in a glass of water (150-200ml) overnight and the extract is taken orally to treat fever, asthma, cold and cough. Crushed seeds are considered most effective to cure those ailments. Plant juice is taken with water to treat jaundice, headache, malarial fever, stomach disorder, gastric, ulcer and anthelmintic medicine. The plant is also used for the treatment of cuts and wounds (Ghimire *et al*. 2008a). Chiraito immersed in half glass of water overnight is taken twice a day to treat diabetes and 1 teaspoon decoction thrice a day is taken to treat fever in Nubri Valley, Gorkha (Pyakurel and Gurung 2006). Paste of plant is used to treat various skin diseases (Manandhar 2002).

It is used as tonic, febrifuge, antidiarrhoetic and to cure various liver problems. The plant is used to control the sugar level in blood. The plant shows antipyretic, sudorific, antiperiodic, anthelmintic, anti-inflammatory and hepatoprotective actions and used in urinary and liver disorders (CSIR 1986).

# Objectives

The major objective of this study is to prepare comprehensive value chain report of Chiraito. Specific objectives are:

- Suggest present value chain constraints in Chiraito referring to other parts of Nepal
- Suggest business service provision gaps and how it can be fulfilled in Panchase area
- Suggest key business enabling environment constraints and opportunities in Panchase area
- Suggest sustainable business system of NTFPs from successful lessons learnt from different parts of Nepal

# Demand and Supply

National Perspective: Chiraito is one of the highest export revenue earning medicinal plants of Nepal and is the source of cash income for the farmers and poor collectors. Bulk of Chiraito originated from Nepal is traded to Indian markets. In the recent years Chiraito is also traded in Tibet in bulk as the price in Tibet is high than that of Indian market. According to an estimate about 45% of Chiraito in the Himalayan region is collected from Nepal (Joshi and Dhawan 2005).

The national consumption for Chiraito has only remained to 5% of the production whereas about 60% % goes to India and about 35% to Tibetan Autonomous Region of China (TAR). Each year more than 300 tons of cultivated and wild collected Chiraito is exported from Nepal to India and Tibet. A study by Pyakurel and Oli (2013) revealed that 232 tons of Chiraito was exported from eastern region of Nepal to India (152 tons) and Tibet (80 tons). Other countries such as Germany, Sweden, Italy, Holland, USA etc also import Chiraito but in the minimal quantity (Pyakurel and Baniya 2011).

Panchase specific: Distribution of Chiraito is confined to Panchase core area and as per the Panchase Protected Forest Management Plan; it is illegal to collect any forest resources, including NTFPs from core area. However there has been reports of informal trade of Chiraito (e.g. as souvenir to the relatives). Likewise, the study team recorded/ visualized few bundles of Chiraito from restaurants in Panchase area. Most household has Chiraito as it has household usage.

Detailed resource assessment is mandatory to assess the present stock of Chiraito in Panchase area. However, it can be estimated that about 700 kg- 1000 kg of Chiraito is available in Panchase area. The stock can be increased by cultivating Chiraito in upper tropical and temperate zones of Sidane, Bhadaure, Tamagi, Chitre and Arther.

# Product Flow

Till date, none of the NTFPs has been marketed from Panchase area thus the marketing pattern and supply chain of Chiraito given here is a general one that exists throughout Nepal. The trading of Chiraito starts with collection from forests and ends with export to India and Tibet. A simplified supply chain for Chiraito in Nepal is given below:

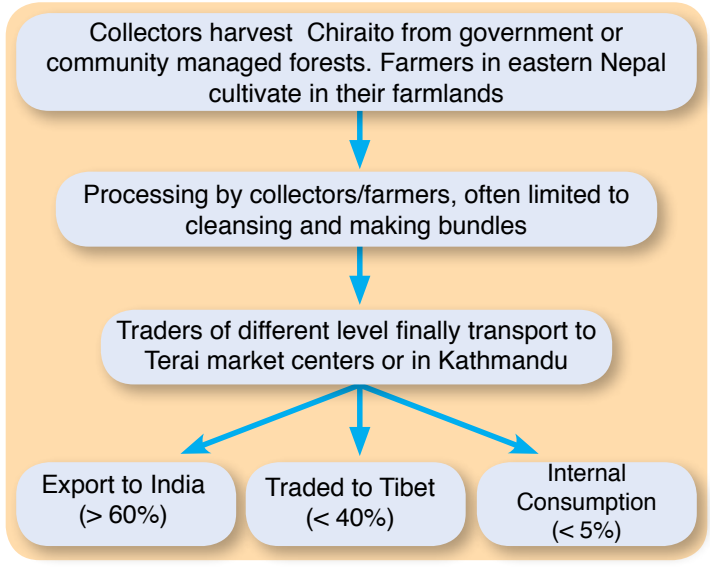


Figure: Supply Chain of Chiraito (Size of box does not represent the volume).

# Value Chain Map

The figure presents the value chain map of Chiraito of Nepal. As the product from Panchase region is not being marketed, a case is given which represents the trade from Nepal. The map shows the role and function of actors, their relationship and function of enablers. The function of actors is given in the left corner and area of intervention for enablers is given in the right corner.

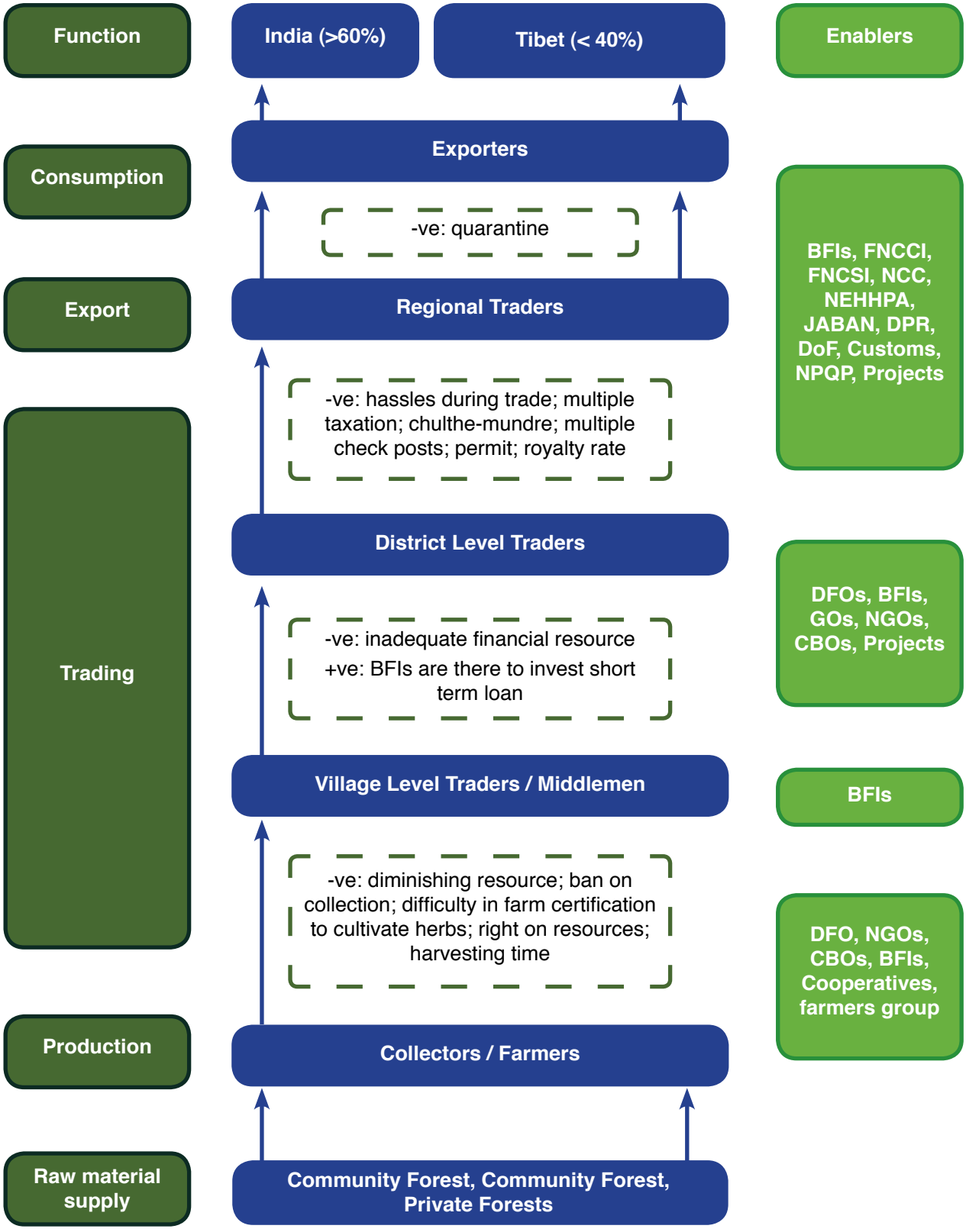


Figure: Value chain map of Chiraito traded from Nepal

## Role and Function of Actors and their relationship

There are various actor involved in conventional value chain of Chiraito such as collectors/ farmers, village level traders, district level traders, regional traders and exporters. As Chiraito is not traded from the district, the actors have to be prepared first. The function of actors and their upgrading is discussed in "funcitional upgrading".

## Enablers

Enablers of "Chiraito value chain" in the present context are those who are likely to work for the value chain actors and provide facilitating and regulatory supports. Activities of enablers ranged from collection to end use, advocacy for simplifying trade policy and procedures, organizing groups and networks for reinforcement, and market information and linkages for better access. Regulating agencies are also working as a facilitator in many cases. The anticipated role of facilitating and regulating organisations for the proper functioning of value chain is given in the table below.

***Table: Anticipated role of facilitating and regulating organisations to move Chiraito in the market chain***

| Major Activities | Facilitating Organizations (anticipated) | Regulating Organizations |
|---|---|---|
| Cultivation and Sustainable cultivation | MDO, EbA, Hariyo Ban, CFUGs | DFO, PPFMC |
| Resource Management | MDO, EbA, Hariyo Ban, CFUGs | PPFMC |
| Collection permit | MDO, EbA, Hariyo Ban | PPFMC |
| Harvesting | MDO, EbA, Hariyo Ban, CFUGs | DFO, CFUGs, PPFMC |
| Royalty Exemption (for cultivated Chiraito) | MDO, EbA, Hariyo Ban | DFO, PPFMC |
| Transport/ Export permit | | DFO, PPFMC |
| Local Taxes | | DDC, VDC |
| Market Information | AEC, ANSAB | |

# Economic Analysis

## Cultivation cost

The cost per hectare is Rs 89,000 for first year, Rs 31,000 for second year and Rs 59,000 for third year. The expert consultation cost is kept Rs 30,000 collectively. Thus the total cost of production is Rs 2,09,000 for three years. About 850 kg can be produced in a hectare and if sold at Rs 600 per hectare (September 2013), the total sales is Rs 5,10,000. Profit per year per hectare is estimated to be Rs 1,00,300.

***Cost per hectare for First Year***

| SN | Particulars | Qty | Rate | Total |
|---|---|---|---|---|
| 1 | Nursery preparation (man days) | 10 | 400 | 4000 |
| 2 | Pipe & other items purchase (set) | 1 | | 20000 |
| 2 | Land preparation | 40 | 400 | 16000 |
| 3 | Seed | 0.2 kg | 10000 | 2000 |
| 4 | Compost fertilizer | 10 tons | 700/ton | 7000 |
| 5 | Plantation in the field (man-days) | 40 | 400 | 16000 |
| 6 | Weeding and composting (man-days) | 30 | 400 | 12000 |
| 7 | Regular watering (man-days) | 30 | 400 | 12000 |
| Subtotal for first year | | | | 89000 |

***Cost per hectare for second year***

| SN | Particulars | Qty | Rate | Total |
|---|---|---|---|---|
| 1 | Compost fertilizer | 10 tons | 700/ton | 7000 |
| 2 | Weeding and composting (man-days) | 30 | 400 | 12000 |
| 3 | Regular watering (man-days) | 30 | 400 | 12000 |
| Subtotal for second year | | | | 31000 |

***Cost per hectare for Third year***

| SN | Particulars | Qty | Rate | Total |
|---|---|---|---|---|
| 1 | Compost fertilizer | 10 tons | 700/ton | 7,000 |
| 2 | Weeding and composting (man-days) | 30 | 400 | 12,000 |
| 3 | Regular watering (man-days) | 30 | 400 | 12,000 |
| 4 | Harvesting (man-days) | 40 | 400 | 16,000 |
| 5 | Drying and storage (man-days) | 30 | 400 | 1,2000 |
| Subtotal for third year | | | | 59,000 |

***Total cost, productivity and profit***

| SN | Particulars | Qty | Rate | Total |
|---|---|---|---|---|
| 1 | Cultivation cost for first three years | | | 1,79,000 |
| | Expert cost (borne collectively) | | | 30,000 |
| | Total cost | | | 2,09,000 |
| 2 | Chiraito production | 850 kg | 600 | 5,10,000 |
| 3 | Total profit | | | 3,01,000 |
| 4 | Profit per year per hectare | | | 1,00,300 |

For wild collection, the harvest quantity is based on the availability in the wild and generally a collector can collect 2-3 kg of dried Chiraito in a day.

## Value Addition

Whole plant is sun dried and care is given so that all the plant parts including the leaves are intact. The plant needs to be well dried as it may develop fungal growth if it stored wet. The perfectly dried Chiraito are made to one kg bundle of about 1m length. Forty small bundles are made to one bundle of 'one maan' (maan: a measurement scale widely used in the hilly regions of Nepal; equal to 40 kilograms), which is the conventional traded quantity for Chiraito. Sorting and grading is practiced by few traders. Few traders are willing to pay extra price to the processed Chiraito. The increment in price for processed Chiraito ranged from Rs 20- Rs 30 per kg.

Attempts have been made by traders to press dried Chiraito to reduce volume for export. Chiraito extract has been isolated in the laboratory but its commercialization is yet to commence.

# SWOT Analysis of Chiraito

***SWOT analysis of Chiraito***

| Strength | Weakness |
|---|---|
| – Traditional knowledge on collection<br>– Priority NTFP for household usage in medicinal purpose<br>– Easy for plantation in marginal land<br>– Successful cultivation practices already carried out in different parts of Nepal | – Almost three years cultivation time resulting less interest of farmers for commercialization<br>– Chiraito cultivation requires higher effort on land preparation, production process, any negligence can decrease productivity<br>– Availability of quality seedlings of Chiraito in only few places of Nepal<br>– High mortality rate<br>– Fluctuating price |
| **Opportunities** | **Threats** |
| – Appropriate Climate and Geography for Chiraito Cultivation<br>– Good demand in national market and product can be sold throughout the year<br>– Compressing opportunities to reduce transportation cost<br>– Possibility of making powders for industrial usage | – Farmers and collectors collect immature Chiraito resulting in unsustainable harvesting<br>– Lack of interest on commercialization of Chiraito in private land in comparison with off season vegetables |

The market based solutions to identified weakness and threats, and to tap the existing opportunities are provided as BDS strategy in next section as a part of Value Chain Upgrading Strategy.

# Value Chain Upgrading Strategy

Value chain upgrading strategies at different levels (instead of interventions and recommendations) is proposed in this report. The value chain upgrading strategies for Chiraito is presented considering the six parameters. These strategies provided in-depth information for the project to develop action plan for each of the strategy for value chain upgrading in coming times. Value Chain strategy for upgrading Chiraito value chain is presented as:

## End Market Strategy

End market strategy is prepared to fulfil the gap between market requirements and present status (other parts of Nepal). This is shown in spiderogram looking at five parameters.

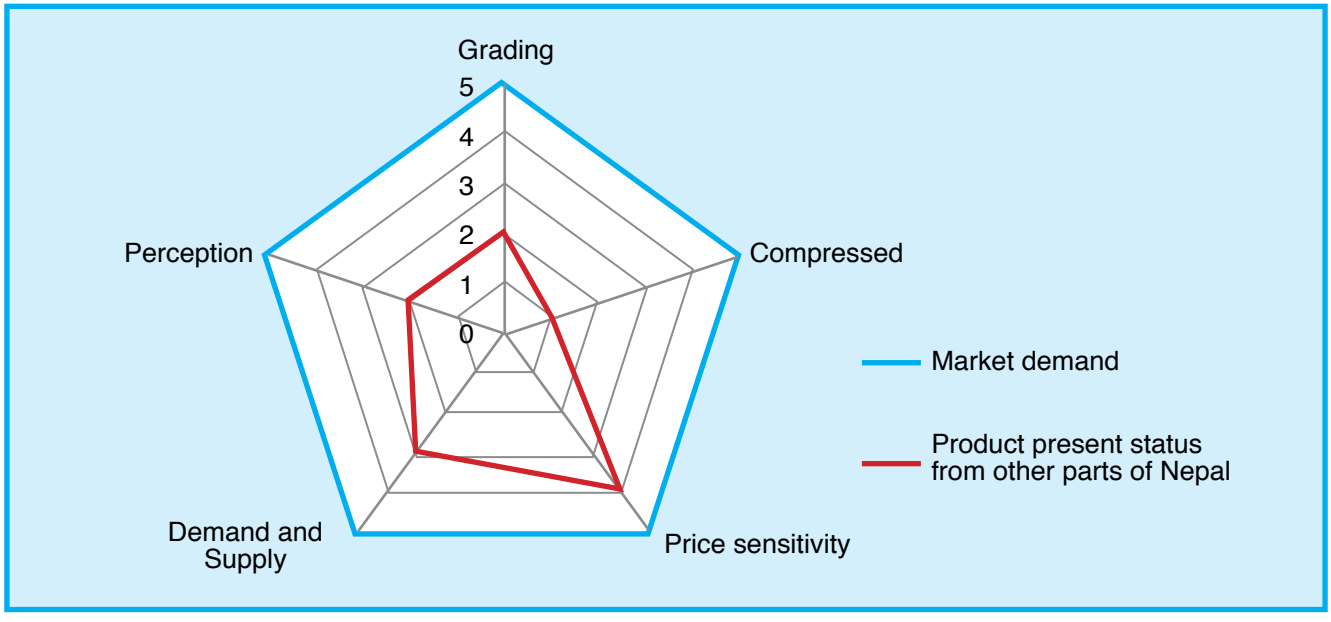


*Figure: Spiderogram that analyzes market demand and gaps*

## Main gaps to be fulfilled are:

### a. Grading:

Among the 30 recorded *Swertia* species from Nepal, 12 species are traded under the name of "Chiraito". Knowingly or unknowingly, collectors often collect more than one species of Chiraito and mix them along with *Swertia chirayita*. Other *Swertia* species are generally regarded as Bhale Chiraito and it accounts for the 20% of the total trade volume. Adulteration of 5% has been reported to be common and is accepted by traders, but excess adulteration reduces the price of Chiraito. In some cases, collectors mix *Exacum* spp., *Androphis paniculata, Ainsliaea latifolia, Slevolgia orientalis* etc with *Swertia chirayita* which has affected the export of Chiraito in the past.

### b. Compressed Chiraito:

Compressor machine helps to reduce the volume of Chiraito. This has not been practiced in most part of Nepal. Resulting the increased transportation cost due to high volume.

### c. Demand and supply:

The demand is high but the supply is less from Nepal. Extensive cultivation practice should be carried out in Panchase area to fulfil the national demand (areas for cultivation is given in Chapter 5.1.3- Demand and Supply).

### d. Price Sensitivity:

Chiraito price has been fluctuating as per demand in China and India. Traders are using both the channels depending on increased market price. Producers are, till date, getting the reasonable price for Chiraito.

### e. Perception:

Chiraito of Taplejung was once considered high quality but lost its brand image due to mixing of male and female Chiraito along with other substance. At present, there is no location branded to produce quality Chiraito. Panchase area can brand itself to produce quality and compressed Chiraito in coming times.

# Firm level upgrading strategy

## Product upgrading

Chiraito in Panchase area is not traded. The product strategy comprised of the following

a. Quality Chiraito production/ cultivation and marketing
b. Compressing of Chiraito to reduce the production cost

## Process upgrading

The process upgrading in Panchase has to be carried out for:

c. Adopting scientific cultivation practices (taking the service of expert farmer who can provide round the clock service during nursery raising, plantation in field, weeding, watering and harvesting)
d. Promoting organic cultivation
e. Usage of compression machine to compress Chiraito

## Functional upgrading

The functional upgrading at each level of value chain can be carried out as:

**Table: Functional Upgrading**

| Actors | Present Function | Upgraded Function |
|---|---|---|
| Herders, Collectors | Collection of Chiraito | Cultivation of Chiraito in private lands and CFs |
| Farmers and young entrepreneurs | NA | Cultivation of Chiraito in private lands and abandoned farmlands |
| Traders | NA | After amendment in the Panchase Protected Forest Management plan, traders should purchase Chiraito from farmers, ensuring the fair price |
| CFs | Conservation of NTFPs | CF should Allocate lands for herders to cultivate Chiraito |
| Cooperatives | Most of the cooperatives are engaged in savings and credit | Cooperative and invest in the cultivation of Chiraito, and later carry out collective marketing. Should use compressors to compress Chiraito |

# Channel upgrading

There has been absence of trade of NTFPs. The important channel to follow is Collection centre NTFPs at each VDC via Cooperative at district level to either Pokhara, Kathmandu or Nepalgunj Market. The anticipated routes would be:

- Bhadaure Tamagi-Kande-Pokhara
- Chitre-Dimwa-Pokhara
- Arther/Ramja Deourali-Syangja or Pokhara
- Syangja-either to Bharawaha via Butawal or to Pokhara
- Products from other VDC also follows the Pokhara or Syangja route

Once the product reaches Pokhara, the product will follow the Kathmandu or Tarai route.

# Transectoral upgrading

The actors involved in Chiraito value chain can also work in Allo, Timur, Kurilo and Orchids value chain to cater the demand of the market.

# Interfirm upgrading

Chiraito has demand in market and Panchase Chiraito can be sold in any markets like Pokhara, Kathmandu and Nepalgunj depending on market price. There is no need for strategic alliance required at value chain actor level and Chiraito can be sold at various markets.

# Business Development services and financial Services

Most of the documents on value chain analysis are based on identifying only pertinent BDS and FS services. The assessment of Business Development Services and Financial services in this report also has been considered taking in view of:

- Categorization of business service demand from beneficiaries (value chain actors) in terms of very strong, strong, weak and very weak categories
- Categorization of supply side of BDS provider's in terms of Very strong, strong, weak and very weak categories.

*Table: Analyzing demand and supply side of BDS*

| | | | | | |
|---|---|---|---|---|---|
| SUPPLY SIDE | Very strong | | Mobilization and sensitization of user group in collective marketing and business orientation | | Subsidized input and social mobilization of user groups |
| | Strong | | Access to market information | | |
| | Weak | Provision of advocating organization and coordination for advocating | Business sensitization training: Business Plans, Production Plan, Crop budgets | Provision of training on Chiraito cultivation<br><br>Access to quality led market information and linkages | Technical knowledge on Chiraito cultivation |
| | Very weak | | Access to financial services | Technology for compressing | Input supply |
| | | Very weak | Weak | Strong | Very Strong |
| | | **DEMAND SIDE** | | | |

Business services which are in demand of beneficiaries in categorization (very Strong, strong and weak) and supply side of service providers (Very weak, weak and strong) are selected to develop commercial viable option for these business services.

The table above shows the business and financial service requirement that can be catered by following commercially viable business service providers:

*Table: Listing out commercially viable business options*

| Services | Strategy |
|---|---|
| Inadequate market Information | Provision of Market Information System in collaboration with DCCI, JABAN, NEHHPA and ANSAB (via web site)<br><br>Coordination and linkage between village, district and regional level traders<br><br>Enhanced use of multipurpose cooperatives to maintain the price list |
| Low access to market | Enhanced coordination between the chain actors, starting from producers to exporters<br><br>Institutionalize the existing market |
| Technology and Product Development | Training and capacity building on nursery management, plantation/production, sustainable harvesting and post-harvest handling for farmers and collectors to produce international buyers' specifications.<br><br>Training on Chiraito cultivation through experienced farmers from Eastern Nepal |
| Inadequate input supplies | Providing healthy seeds and seedlings to farmers<br><br>Strengthening and capacitating input suppliers (agro-vets, nurseries, lead farmers ) |

## Business Enabling Environment Upgrading Strategy

The Panchase Protected Area Management Plan impose ban on collection of any forest resources from the core forest area. It should be lifted after resource assessment. Likewise, there should be provision of cultivation and sale of NTFPs in community forests. These two are the basic business enabling environments.

## Sustainability Strategy

The most important sustainability strategy for Chiraito is to create a brand image of Chiraito from Panchase area. This can be done through upgrading at all level of value chain mentioned as above as strong presence of PPFMC for determining the quality Chiraito production and marketing.

# ABBREVIATION

| | |
|---|---|
| AEC | Agro Enterprise Centre |
| ANSAB | Asia Network for Sustainable Bio-resources |
| BDS | Business Development Services |
| BFIs | Banks and Financial Institutions |
| CBOs | Community Based Organisations |
| CFs | Community Forests |
| CFUGs | Community Forest User Groups |
| DCCI | District Chamber of Commerce and Industry |
| DDC | District Development Committee |
| DFO | District Forest Offices |
| DoF | Department of Forests |
| DPR | Department of Plant Resources |
| EbA | Ecosystem Based Adaptation |
| FNCCI | Federation of Nepalese Chamber of Commerce and Industries |
| FNCSI | Federation of Nepalese Cottage and Small Industries |
| GF | Government Forests |
| JABAN | Jadibuti Association of Nepal |
| LF | Leasehold Forests |
| MDO | Machhapuchre Development Organization |
| NCC | Nepal Chamber of Commerce |
| NA | Not Available |
| NEHHPA | Nepal Herbs and Herbal Products Association |
| NGOs | Non Governmental Organisations |
| NPQP | National Plant Quarantine Programme |
| NTFPs | Non-Timber Forest Products |
| PPFMC | Panchase Protected Forest Management Council |
| SWOT | Strength, Weakness, Opportunities, Threats |
| VDC | Village Development Committee |

## For Further Information


**Project Management Unit**
Forestry Complex. P.O.Box.24417
Babarmahal, Kathmandu, Nepal
Tel: 104218458, Fax. 014225553
Email: info@eba.org.np
Web: www.dof.gov.np/eba

Field Office
Pame, Pokhara, Kaski, Nepal
Tel: 061621553


# REFERENCES


CSIR, 1986. *The useful plants of India.* Publications & Information Directorate, Council of Scientific and Industrial Research (CSIR), New Delhi, India.

Ghimire S.K., Pyakurel D., Nepal B.K., Sapkota I.B., Parajuli R.R. & Oli B.R., 2008a. *A Manual of NTFPs of Nepal Himalaya (Gair Kastha Ban Paidawar Digdarshan)*. WWF Nepal, Kathmandu, Nepal. (In Nepali)

Ghimire S.K., Sapkota I.B., Oli B.R. and Parajuli-Rai R., 2008b. *Non Timber Forest Products of Nepal Himalaya: Database of Some Important Species Found in the Mountain Protected Areas and Surrounding Regions*. WWF Nepal, Kathmandu, Nepal.

Joshi P. and Dhawan V. 2005. Swertia chirayita- an overview. *Current Science*, **89**(4): 635-640.

Manandhar N.P. 2002. *Plants and People of Nepal*. Timber Press, Portland, Oregon.

Polunin, O. & A. Stainton 1984. *Flowers of the Himalaya*. Oxford University Press.

Pyakurel D. and Gurung K. 2006. *Identification and Inventory of Non Timber Forest Products (NTFPs) of Manaslu Conservation Area*. A report submitted to National Trust for Nature Conservation / Manaslu Conservation Area Project (NTNC / MCAP), Gorkha.

Pyakurel D. 2008. *Resource Assessment of Chiraito (Swertia chirayita) in Langtang National Park Buffer Zone Area*. A report submitted to LNPBZ-SP/WWF, Rasuwa.

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*. WWF Nepal.

Pyakurel D. and Oli B.R. 2013. *Market study of Tradable and Economically Important Medicinal and Aromatic Plants of Eastern Nepal (using Value Chain Approach)*. A report submitted b BARDAN to Department of Plant Resources.