



A Field Manual on Nursery Management and Cultivation of **Chiraita** (*Swertia chirayita*)



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ANSAB

ABBREVIATIONS

ANSAB	Asia Network for Sustainable Agriculture and Bioresources
CFUGs	Community Forest User Groups
DzFO	Dzongkhag Forest Officer
FIMS	Forest Information Management System
GOs	Government Organizations
FYM	Farm Yard Manure
IFAD	International Fund for Agricultural Development
MAGIP	Market Access and Growth Intensification Project
MoAF	Ministry of Agriculture and Forests
NWFP	Non Wood Forest Products
SNV	Netherlands Development Organisation

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About this Manual

This manual provides guidance and instructions for nursery development, cultivation and domestication of *Swertia chirayita* (Chiraita). Since the focused species is depleting at a faster rate from its natural habitat due to incorrect harvesting pattern by the collectors and the changing global climatic factors, this manual provides a basis for the sustainable production and management of Chiraita.

This manual is a bridge that fills the gap for Chiraita development experienced by the local farmers, NWFP group, forestry field officials and conservation organizations. This manual was developed primarily based on the experience gained during the hands-on training at the field level at Gomdar district of eastern Bhutan, and the extensive experience of ANSAB over the past two decades. Hence it is expected that the manual will be useful to those who want to conserve and manage the NWFP as a part of their conservation and development tasks.

Objectives of the manual

This manual is an outcome of both theoretical and practical experience of the ANSAB, and the three days hand on training. Hence, it provides a practical path and tool for establishment, development, management and care for the nursery of Chiraita.

The major objectives of the manual are to:

- Provide and disseminate the practical method of development and management of Chiraita nursery, and transplanting and cultivation techniques for Chiraita.
- Promote the local farmers, NWFP groups and forestry field officials toward the domestication of Chiraita.

Who is this manual for?

Although this manual has been proposed for the use of local farmers, NWFP groups, forestry field officials and local level facilitators, and forest technicians involved in supporting, promoting and

managing the NWFP at different levels, this manual can be useful for researchers, local resource persons, community level farmers, leaders, traders of NWFP, and community based organizations.

Also it is expected that the forestry field officials can be efficiently trained so that they can work with the local NWFP group, farmers and the community as facilitators will be able to carry out the activities mentioned in this manual.

What does this manual contain?

The manual is divided into three sections. The first section includes background information, biology, taxonomy, habitat range, ecology, regeneration, lifecycle, harvesting and uses of Chiraita. The next two sections include management and nursery development techniques of Chiraita.



Section 1: Background information on Chiraita (*Swertia chirayita*)

1. Taxonomy

Scientific name: *Swertia chirayita* (Robex. ex Flem) Karsten

Family: Gentianaceae

Local name: Chiraita, Tite, or Lektite or Khalu

English Name: Chiretta

Swertia chirayita is a biennial or perennial herb of seasonal growth. It usually has a single, stout, elongated stem, the size of which ranges from 60cm to 150cm with branching at tip. However, in a few cases, branching from the root has also been recorded. The color of the stem is greenish-brown when the plant is young and changes from light brown to light violet as the plant attains maturity. The stem is cylindrical at the base and quadrangular upwards. The roots are generally small, 5-10cm in length, light brown, somewhat twisted and gradually tapering, and have a few rootlets or remnants. Flowering pods are egg-shaped, and the seeds are minute, smooth, and many angled. Flowers are monocious, greenish yellow, tinged with purple. The seeds are light brown to dark brown in color.



2. Habitat and range

Swertia chirayita is endemic to the temperate Himalayan region and is distributed between the altitudes of 1500m to 3000m in Kashmir (India), Nepal and Bhutan (Bhatt et al. 2006). The plant prefers North and Northwest-facing moist habitats in forests, rangelands and around cultivated lands. It is distributed from east to west, but is more common in the eastern hills both in terms of quality and quantity. The Chiraita population in the wild mainly consisted of juveniles, followed

by rosette stages and adults (Pyakurel 2008). Major relatives of Chiraita are Anaphalis sp, Desmodium sp, Anemone obtusiloba, Elsholtzia spp., Fragaria spp., and Oxalis corniculata (Ghimire et al. 2008a, Pyakurel 2008).

According to the “Flora of Bhutan”, 19 different species of Swertia are found in Bhutan. Among these, the commercially valuable species is Swertia chirayita. In Bhutan, it grows abundantly in the regions of Singkhar, Lauri in Samdrup Jongkhar Dzongkhag (SNV, Bhutan 2008).

3. Ecology of Chiraita

Chiraita shows a rosette form in the first year whereas two years old plant has elongated stem with yellow flower. Distribution of Chiraita is not uniform; it depends upon the altitude and slope. It prefers to grow on North-facing slopes. Chiraita prefers to grow in acidic soil condition with pH of 4.7 to 5.5 (Bhattarai & Shrestha, 1996). Chiraita has been found in association with other species like Bhuin Kaphal (Fragaria indica), Bukephool (Anaphilis triplinervis), Chari Amilo (Oxalis corniculata), Dubo (Cynodon dactylon), Ghans (Digitaria adscendens), Titepati (Artemesia vulgaris).

4. Regeneration

The natural regeneration of the plant takes place when the seeds become biologically mature, having high potentiality of viability in November (Bhattarai N.K., 1991). The viability of seeds is very low if seeds are collected before November. Seeds stored in poor conditions i.e. if stored in cold places, and open vessels have no viability at all. The viability decreases after the next October. If seeds are collected after November and cleaned properly, the percentage of germination is reported up to 90% (Bhattarai, N.K., 1991).

5. Lifecycle

Germination takes place in December to January of the first year and root development occurs. During second year, the height increases. The flowering occurs in July, and fruiting in August to December depending upon the locality.

6. Harvesting

Chiraita plant should be uprooted when the seeds are dispersed i.e. November- January. The plants are dried in the sun and tied with a thin bamboo strip to make the bundle and carried on to transportation. Chiraita should be harvested after three years of plantation: when the plant is well developed, it will flower and produce fruit . If harvesting is done after the seeds are matured, then the plant can naturally regenerate. Harvesting Chiraita without considering the age of the plant and seed maturity reduces regeneration significantly. Harvesting should be carried out in November to December after dispersal of seeds (Raisaly, N.K., 2003).

7. Uses

Chiraita occupies one of the major positions in the trade of medicinal and aromatic plant; it is a valuable Ayurvedic medicinal plant in Nepal and India. The whole plant is used for medicinal purposes. Chiraita has the following two types of uses:

Substantial Use

Chiraita is an important medicinal herb used for curing various diseases. Locally this plant is given for malarial fever. The plant is dipped in water overnight and the bitter juice is taken the next morning. It is also used in common ailments like cough, cold, and fever. This plant has a bitter, sharp taste; it is used as an astringent tonic and stomachic agent. It relieves inflammations and improves eyesight. It is given as a sedative during pregnancy. Chiraita is considered good for joints pain, scabies, leucoderma, skin disease, asthma, ulcer and chronic fever.

Commercial Use

The main active principle is 'Chiretin'. Nine oxygenated xanthone has been isolated from the whole plant (Gnosal et.al, 1973). They are included in the Secoirrodoid glucoside group as Amarogentin and Amaroswerin.

Recently an increased demand for *S. chirayita* has been observed. The product has been discovered by the beverage industry as an

alternative bitter product (i.e. used in the liquor industries to impart the bitter flavor). Chiraita is also used as one of the ingredients in “Chandra Prabati” which is an Ayurvedic drug for cancer.



Section 2: Management System

Chiraita can be managed through the following ways:

1. Naturally occurring Chiraita managed by community
2. Farming/Cultivation of Chiraita

1. Naturally occurring Chiraita managed by community

Generally, natural growth of Chiraita occurs in the forest. The bulk of the Chiraita grows on government-managed forests that have not been handed over to forest user groups. There is always a vast and irregular competition for collecting the Chiraita as it brings in additional income. The collectors collect Chiraita before the seed disperses naturally. Seeds are the only medium for the propagation of this plant, so if the plant is collected before the maturation and dispersal of seeds, there will be no future regeneration. Unhealthy competition between the collectors has led to the over-harvesting of Chiraita without consideration of sustainable regeneration. Not only does premature harvesting have a negative impact on regeneration, immature plants decrease the active ingredient quality of the final product. Therefore, if the community is managing the forest there should be a Chiraita management plan prepared by the community and implemented effectively like other forest products, so that the sustainable management of the Chiraita can be assured.

2. Farming/Cultivation of Chiraita

Due to increasing demand of the Chiraita and the increasing number of entrepreneurs, farmers are interested in cultivating Chiraita on their private farmlands, using a simple technology where the climatic condition is favorable for Chiraita growth. Also, areas of farmlands that are unproductive for major crops and cereals could be used for the cultivation of Chiraita.

Section 3: Nursery development techniques

1. Seed Extraction Methods

Step 1: Seed Extraction

- Extract the seed from fully mature plants at the end of the growing season i.e., November.
- Dry the plants and then shake or thresh the plant lightly with the help of stick and extract the seeds.
- Sieve the extracted seeds to avoid contamination.

Step 2: Seed Storage

- Dip the seeds in cold water and let soak for an hour. The light and unripe seeds will float, and the ripened will settle on the bottom of the pot.
- Collect the sound and viable seeds settled at the bottom of the pot and dry them in the sun for about 3-4 hours.
- Keep the extracted seeds in a cotton sack or Puplin bag and store in a cool dry place.

Step 3: Seed germination and viability

- Germination rates are very low for the seeds collected during September and October.
- Seeds are viable for less than a year; therefore the seeds collected should be sown within the following season.
- The viability of seeds varies with the maturity of the plant and is reported to be high (up to 90 %) if seeds are extracted during November (Bhattarai and Basnet 2000).

2. Nursery Development

Step 1: Site Selection

- Select a site with black, sandy and porous soil with abundant organic soil matter.
- Chiraita prefers to grow on north facing slopes.
- Chiraita grows best in acidic soil condition with pH of 4.7 to 5.5
- Select a site that has a permanent source of water.
- Select the site at a central location as to avoid the transportation of seedlings over long distances.
- Select a site with a gentle slope sufficient to allow excess water to run off without causing soil erosion.



Step 2: Soil and bed preparation

- Remove the tree, shrubs, gravel stones and any other unwanted weeds from the nursery site.
- Dig the soil by removing the first 5 cm of topsoil, and mix the soil with organic fertilizer.
- The nursery bed should be 5cm above the ground level.
- Collect the forest topsoil, sand and farm yard manure and sieve them.
- Mix one part of forest soil, 2 parts of sand and 1 part of farm



manure. Lift the bed about 5-10 cm from the ground with homogeneously mixed soil.

- Outline the bed with bamboo, wooden flake or brick.
- Make a 50 cm wide path between the two beds.
- The width should not be more than 1 meter and length should be about 10 meter (i.e.10x1) for the Chiraita bed.
- Now divide the beds into 1m² sub blocks in the nursery.



Step 3: Seed sowing

- Seeds are sown by mixing seeds with sand or ash (1:100 ratios).
- Mix the 1 gm of seeds with 100gm of sand.
- 1 gm of seed is sufficient for sowing 1m² areas in nursery bed.
- Put 1 gm of seeds in the glass vessels and make small holes on



its cover. Then sow the seeds on the bed by shaking the glass vessels.

- Do not sow the seeds when there is a wind.
- Sow seeds from the height of 30-50 cm of the bed.
- After sowing the seeds on the beds, gently press the surface of the bed with the help of a dry bamboo pole.
- The best season/time for sowing seeds is in March, April and May.
- Mulch the seed beds with straw or pine needle.
- The mulch should not be more than 8 cm thick.
- Water twice or thrice a day. It depends upon the moisture content of the bed.
- Initially, watering the bed should be done by water spray, because it protects seeds from washing away.



Step 4: Shading

- Shading is required to protect the seedbed from the heavy rain, direct sunlight, hailstorms, frost etc.
- Prepare the shade using locally available material like bamboo, straw or plastic sheet or other such shading materials.



- The shade is made at the sufficient height that (5 to 6 ft) one can easily move beneath the shade on the bed.

Step 5: Seed germination

- Seeds sown in March, April and May can grow within 18-35 days. Seeds sown during November and December may take longer time to germinate i.e., up to 2 months.
- Remove the mulch from the beds as soon as the seed starts germinating.
- Weeds grow at a faster rate when compared to Chiraita. Hence, the small plants on the beds must be identified, as Chiraita and weeding should be done timely.
- Weeding should be performed during the first year.

Step 6: Watering

- Water the seedbed twice or thrice a day; during the hot season thrice a day.
- As the seeds of Chiraita are very minute, very light watering should be done with the help of water spray until the seeds start to germinate.
- Make well-drained channels in the nursery beds to avoid water logging.

Step 7: Fencing

- Fence the nursery properly using locally available materials like bamboo.
- Live fences can be grown around the nursery such as fodder species or some grasses like napier.



Step 8: Hardening off

- 'Hardening off' to seedlings is required. It refers to the progressive withdrawal of favorable growing conditions of seedlings in the nursery.
- This treatment should begin no later than halfway (after the six months of seed sowing) through the life of the seedling in the nursery.
- Hardening should be done on the mother bed only.
- Pricking is not recommended.
- The main treatment involves the reduction of water and full exposure to sunlight. Note that while the reduction in the amount and frequency of watering is usually a gradual change from two or three applications per week, it depends on humidity of the area.
- Transfer the seedlings to the plantation site carefully by putting them in the gunny bags.



Section 4: Cultivation and Harvesting

1. Field preparation and Transplanting

Field Preparation

- Prepare the plantation site correctly by ploughing the field twice. All the weeds, shrubs should be removed from the field.
- Controlled burning to the planting site is recommended if possible.
- The field selected for plantation should face north as far as possible.
- Add one ton of compost manure to one hectare of plantation site.



Transplanting

- After a year of seed sowing, seedlings are ready for transplanting into the field.
- A seedling should only be transplanted when it holds 5-6 leaves.
- Plant the seedlings on a 5-10 cm raised soil bed in the field.
- Plant-to-plant distance should be 20-30 cm, while row-to-row distance must be 30 cm.
- The best time for transplanting is May and June.



2. Harvesting and Marketing

Step 1: Harvesting

- Harvesting should be done 18-39 months after the seedlings transplantation.
- Uproot the whole plant since there is no possibility of coppicing in Chiraita.
- Leaving some 10% of the mother plant on the field can enhance the natural regeneration.
- Seed tree is required for natural germination.
- November is the best season for harvesting but it may also depend on the elevation, which affects the seed ripening and plant maturity.



Step 2: Drying plants

- Dry the harvested plants in the sun on an open ground where there is appropriate overhead sunlight.
- 4-7 days will be the sufficient time for drying Chiraita plant.
- While drying the plant, spread harvested plant material on the clean ground or floor or over sheet of plastic.
- The roots of the plant are kept outside the plastic sheet. It will prevent mixing the root soil with the plant seeds.



Step 3: Storage and packing of dried plant

- Clump the harvested and dried plants and put in the jute bag for

storage.

- It is recommended that the dried material should not be stored in the nylon bags as there may be a risk of decay.
- Keep the dried plants in the jute bags.
- The dried materials must be kept in the jute bags and stored in well-ventilated areas. In this way, it can be stored safely up for two years without any loss in the quality of the Chiraita.



Step 4: Marketing

- Proper packing of the dried materials should be done for making it ready for market supply.
- Prior to sending it to market the permit for sale from the concerned office /department is necessary.



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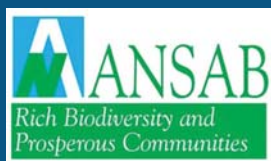
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