

V. Bamboo and rattan resources

Ethnobotany of Bamboo and Rattan and Their Indigenous Management and Utilization In Chittagong Hill Tracts

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Introduction

The Chittagong Hill Tracts (CHTs) are inhabited by a variety of tribes, each speaking its own distinct dialect. The major hill tribes are - *Chakmas*, *Maghs* (*Marma*), *Tipara*, *Mro*, *Kuki* or *Lushai*, *Kumi* or *Khweymiki*, *Khyangs*, *Pankhos*, *Banjogis* or *Banjos* or *Bawm*, etc. (Ishaque 1971). The dialect of *Chakmas* and *Tipara* has some similarities with Bangla language, where as others have more similarities with Burmese language.

The *Chakmas*, *Maghs*, and *Tiparas* resides on the river bank or streams, while other tribes prefers the summit of the hills. The *Chakma* tribes are scattered throughout the CHTs, but a majority of them live in Rangamati and Khagrachari districts. *Chakmas* have an auxiliary tribe known as *Tangchangyas*. At present there are more than 0.25 million *Chakmas* living in CHTs. *Chakmas* have their own alphabet which has somewhat similarities with the Mankhemor alphabet of Cambodia and Burmese alphabet. They are Buddhist by religious belief. The *Chakmas* now form a settled tribe, and the same village site is occupied by them from generations.

The *Mugh*s who prefers to call themselves *Marma*, are the second largest group of ethnic people living scatteredly throughout the CHTs. The majority occupy the Bandarban districts. Their population is about 0.2 million. They are also buddhist by religion. However, few of them

converted to Christianity during the reign of British. *Marmas* have their own alphabet and has similarities with that of Burmese. They are mostly shifting cultivators (*Jhumias*).

The *Tiparas* are third largest ethnic group of people living scatteredly throughout the Hill Tracts specially in the northern part boardering to the neighbouring Tripura state of India. Their population is about 60,000. *Tiparas* are hindu by religion. Once they had their own alphabet for writing. Now-a-days, they mostly use Bangla alphabets. They are mainly *Jhumias* and some also work as labourers in tea gardens.

Mro or *Murong* is one of the important ethnic group of people of CHTs. Their population is about 50,000 living mostly over the hills to the west of the Sangu river and in Matamahuri valley. They are basically descendant of Burmeses and generally nomadic in habit.

Bawm or *Banjos*, *Pankhos*, *Khyangs*, *Kumi*, and *Lushai* are small groups of ethnic people living mostly in Bandarban districts of CHTs. They are mostly shifting cultivators and believe in Christianity.

The tribal people are mostly forest dwellers in the hills and critically dependent on these resources while the total population of the country deriving benefits from them is substantially greater. The ethnic people treat the forests as their habitat. Plants are the integral part of their lives for food, shelter, health, religious and cultural

activities. The indigenous traditional practices developed by the local ethnic people offer repositories of valuable knowledge in conservation and sustainable utilization of forest resources. Little is known about the integration and the role of bamboos and rattans in the lives of ethnic people in the hilly areas of Bangladesh. Therefore, a preliminary investigation has been made in this regard.

Materials and Methods

A number of field visits were made in Kaptai, Bandarban and Ramgarh of Chittagong Hill Tracts for interviewing the local people and to make survey in the local rural markets regarding collection of information on bamboo. Most of the visits were made during November-December and June-July of the year 1996-97.

Bandarban

Bawm tribe: Laipara is a settlement village in the Bandarban hills. About 25 families have been settled there during 1980-82. The details of the persons interviewed are given below:

Name	Age(Yr.)	Profession
Mr. Lei Niar	72	Priest
Mr. Za Thawg	78	Jhumia (Shifting Cultivator)
Mr. Nawl Khar	67	Jhumia
Mr. Lalro Sawm	42	Teacher of the local school

Mr. Lalro also acted as interpreter during the interview. Christianity is the religious belief of the people of this village.

Marma tribe: Chemi Dalu para is more than 150 years old tribal village located about 10 km from Bandarban town by crossing the Sangu river. There are about 160 households and 1000 peoples live in

this village. They are all Buddhist by religious belief. An interview was made with Mr. Furisha Karbari, age 70.

Murong tribe: Empu Para (tanka pathi) is an 150 years old village, located 8 km towards the south of Chimbuk hill of Bandarban. There are about 23 households with 150 persons living in the village. Two persons were interviewed.

Name	Age(Yr.)	Profession
Mr. Conglok Murong	69	Priest
Mrs. Thidon Murong	69	Jhumia (House wife)

Tanchangya tribe: Swalock Profulla para, there are 13 households with 70 persons inhabiting in the village. The persons were interviewed.

Name	Age(Yr.)	Profession
Mr. Lanto Kumar Tanchangya	54	Jhumia/settled farmer
Mr. Profulla Kumar Amu	49	School teacher

They are Buddhist by religion.

Khagrachari and Rangamati

Tripura tribe: Golabari Tipara Para is situated towards the Rangamati road. There are about 67 families. The following two persons were interviewed.

Name	Age(Yr.)	Profession
Mr. Ranjan Kumar Tripura	48	Jhumia
Mr. Karchandra Tripura	55	Jhumia

Marma tribe: Changra Chari Para is situated on the Khagrachari-Rangamati road. About 150 families residing in the village. Mr. Mong Pu Su Marma, 65 years

of age and jhumia by profession has been interviewed. They are all Buddhist and the village has a beautiful bamboo and wooden made Kiang (Buddhist temple).

Local markets: Shanirvar bazar in the superb of Khagrachari town and Bichitola market located on the Khagrachari-Rangamati Road have been visited. Part time vendors come to the market place not only to sell produce harvested in their own community but also to buy goods from others. They interact with many full-time vendors, including local middlemen.

Kaptai

In Kaptai forest Bengchari area was visited. The following persons were interviewed. They belong to *Marma* tribe.

Name	Age(Yr.)	Profession
Mr. Mong Chila	45	Plantation mali
Mr. Usula Marma	55	Local villager
Mr. Mra-cha Pru	60	Local villager
Mr. Suekhai	50	Local villager
Mr. Pai-cha Marma	65	"Baidhya" (Prescribes local herbal medicine)

Hazarikhil and Fatickchari

Tipara tribe: Kantiram Majhi para (Dukan para) about 200 years old village. There are 16 households and 70 persons present in the village. All the inhabitant are of Sanathan religion (Hinduism) by belief. The following persons were interviewed.

Name	Age(Yr.)	Profession
Mr. Ramdas Tripura	80	Tea garden labourer
Mr. Sonaram Tripura	50	Tea garden labourer

Results and Discussions

Ethnoecology of Bamboos and Rattans :

The bamboo is present throughout the CHTs as an undergrowth of the high forests and in some areas as a pure vegetation in Kassalong, Rankhiang and Sangu and Matamuhuri reserves. There are about six species of bambo occurring naturally in the hills. The species are *Melocanna baccifera* (Roxb.) Kurz (bangla name: *muli*), *Bambusa tulda* Roxb. (bangla name: *mitinga*), *Dendrocalamus longispatus* Kurz. (bangla name: *ora*), *Schizostachyum dulloa* (Gamble) Majumdar (bangla name: *dalui*), *Oxytenanthera nigrociliata* Munro (bangla name: *kali*), and *Melocalamus compactiflorus* (Kurz) Benth. (bangla name: *lata*). Among them *M. baccifera* is most common and constitute 80-90 per cent of the total bamboo vegetation. Besides these, *Bambusa vulgaris* Schrad. ex Wendl. (bangla name: *baizzya*), *B. polymorpha* Munro (bangla name: *bethua*), and *Dendrocalamus giganteus* Munro (bangla name: *bhudung*) have been introduced in unknown past and also being cultivated by the local hill people. The bamboo jungles of CHTs are very important to the lives of local people and from the commercial point of view. In fact, these species are not hardy as *M. baccifera* and cannot thrive well in the drier and exposed sites on the hills. The clumps of *B. vulgaris* are usually planted on the slopes.

On the contrary to bamboo, a rattan plant flowers every year and regenerates through seedlings. *Calamus erectus* Roxb is found on slopes, mixed with scrub vegetation. The species prefers drier slopes. The *C. guruba* Buck.-Ham (bangla name: *chikan*) is very common and naturally occurs in the lower hill slopes of mixed evergreen forests and prefers moist and shady habitats. *C. latifolius* Roxb. (bangla name: *bhudum bet*) is stout, extensive climber, clustering to form dense clumps, attaining more than 50m in length.

This group of plant is found in the plains and hill slopes of evergreen rain forests. Grows well on moist sandy-loam soils. *C. longisetus* is very robust clustering to form dense clumps, erect to climbing, generally occurs in the dry hill slopes, sandy-loam soils of mixed evergreen forests. *C. tenuis* Roxb. is not common on the hills. *C. viminalis* Willd., var. *fasciculatus* (Roxb.) Becc. ex. Beccari and Hook. f. (bangla name: *karak*) is clustering to form dense clumps, scrambling forming thickets in open ground, climbing with support, commonly found on the dry, scrubby vegetation. *Daemonorops jenkinsiana* (Griff.) Mart (bangla name: *golak*) has thick, big stem and usually grown on moist hill slopes.

As the ethnic people are mostly nomadic by nature, they generally collect bamboos and rattans from the wilderness. However, in some areas of the Hill Tract people have been settled in the villages from generations and cultivating some bamboo and rattan species in their homestead for day to day utilization. Preference ranking of the value of different bamboo and rattan species in respect of homestead cultivation (5, most valuable; 1, least valuable) is shown in Table 1. As regards bamboo, *baizzya* and *ora* scored highest point. *Mitinga* bamboo has very irritating hairs on the new young stem and also on the culm sheath and therefore people do not want to cultivate in their homesteads. Besides, they informed that culm sheaths of this species take long time to get rot and mix with the soil. As a result, no other species can grow under *mitinga* (*B. tulda*) bamboo.

People usually do not cultivate rattan in their homestead. In some occasions, a few species of rattan are cultivated and among them chikan bet found to be most common.

Ethnotaxonomy: Probably from the prehistoric time the man used to identify

the plants for their uses. The local people *Marma*, *Murong*, *Chakma*, *Bawm* and *Tipara* identify all bamboo and rattan species on the basis of different vegetative characters. In case of bamboo stem size and colour, internodal characters, leaf size and culm sheath characters are considered, while in case of rattan emphasis is given on stem and leaf size and their characters. Among the naturally growing bamboo species local people mostly utilise and prefers only four species. Their characters are described below.

Melocanna baccifera Kurz (Roxb.): The clump is open. The culms are thinwalled, nodes are comparatively not raised. The leaves are comparatively narrow and elongated. The culm sheath has no or little hairs. This species produces more culms than any other bamboos. It grows fast and invade the hills very quickly. Fruits are big succulent.

Bambusa tulda Roxb.: The clump is bushy. The culms are not so thin walled, nodes are comparatively raised. The tip of the leaves are sharply pointed, the ventral side is whitish faint green. Culm sheath at young stage is green, with brownish hairs which is usually irritating, persistent on the basal nodes of the young culm usually up to the next *Falgun* (February-March) month.

Dendrocalamus longispatus Nees.: The clump is bushy, attractive and branches are on the upper half. The culms have somewhat long internode usually each node has two ridges, young culm is glaucous green and usually covered by long papery remnants of sheaths and dark brown pubescence. When culm is cut has powder inside the internode. Culms are also used for famous bamboo dance. The leaf is gradually acuminate at the tip. Culm sheath is long and cover the whole internode. Somewhat resistant to ghoon. Comparatively strong than *Melocanna baccifera*. The species is used for thatched

wall, best among all species, even than *Shizostachyum dullooa*, because *S. dullooa* has very thin wall.

Shizostachyum dullooa (Gamble) Majumdar: The clump is bushy, congested. Culm is very thin-walled and has long internode, wall skin is very sharp when cut. Leaf is big, bigger than that of *D. longispathus*. The culm towards the sun attains slightly reddish colour, while in the deep valleys and shady sites becomes deep green.

Local people also cultivate *Bambusa vulgaris* in their homesteads. They use this bamboo for construction purpose. *Dendrocalamus giganteus* is mostly cultivated in the sacred places like buddhist temple (Khang).

The different tribe has different names for each of the bamboo and rattan species present in the areas (Table 2 & 3).

In Bangla language bamboos are called *bans*, similarly *Chakma* people also call *banz*. It appears that other tribes have their own name for bamboos. The *Bawm*, *Lusai*, *Marma*, *Murong*, *Tanchangya* and *Tipara* call bamboo as *mau*, *hru*, *kawoo*, *baith*, *yeaha* respectively. Each of the species has also separate names. Thus it appears local ethnic people have been identifying bamboos by two names- one generic and other is species name (Table 2). Like modern biological science they have been following some sorts of binomial nomenclature.

Chittagong Hill Tracts is rich in rattan resources in respect of species diversity and abundance. Rattan being a climbing palm grows naturally in the high forests. The species are *Calamus erectus* Roxb., *C. guruba* Buch.-Ham., *C. latifolius* Roxb., *C. longisetus* Griff., *C. tenuis* Roxb., *C. viminalis* Willd., var. *fasciculatus* (Roxb.) Becc. ex. Beccari and Hook.f., and *Daemonorops jenkinsiana* (Griff.) Mart. Among them *C. guruba* and *D. jenkinsiana* are commonly

used by the local people for weaving and binding purposes. *Murong* tribes calls rattan as *souin* while *Tanchangya* tribes calls them as *moicha*. Clear felling forestry operations have accelerated the deforestation of old trees and thereby rattans are disappearing in alarming rate.

Harvesting and Indigenous Utilization: Ethnic people harvest bamboos and rattans in a specific time of the year. They cut bamboo during bangla month *Karthic* to *Poush* (November to March), the dry and winter season of the year. Bamboos are never cut after leaf-fall. For construction purpose only the mature bamboos are cut from the clump. Local people can identify the ripe bamboo by listening the sound by beating the back side of *dao* on the bamboo stem. Young bamboos are left in bush. People can also identify the ripe bamboo from some morphological characters. These are smooth culm surface with light yellowish colour and absence of culm sheath. There is a belief that if bamboos are felled in the first day of new moon bamboos will be more durable and resistant to ghoon.

The rattan canes are also harvested during dry and winter season. Only the mature stems which have less or dead leaves are collected and cleaned by removing the branches and spines.

The local hill people has been using only one implements *dao* for different construction and agricultural works. The *dao* is 0.3 - 0.6 m long and 4 - 5 cm wide flat iron made sharp knife. They also use *dao* for protecting themselves from any attack of wildlives. They rarely use axe. So it appears that the tribal people are not the destroyer of big trees.

Housing: Bamboo is much used as material for the construction of houses, fences, bridges and a great variety of implements. To the hill people, bamboo is a traditional building material. The houses

are built entirely of bamboo, raised from 1.5 - 2 m from the ground by means of bamboo or some times wooden supports. The floor and walls are made of bamboo split and flattened out of and then woven together. The frame-work of the roof is also made from bamboo, with cross-pieces of wood, the whole securely fastened together with strips of rattan cane. Sometimes the roof is thatched with palm leaves called "Krook pata", cane leaves or grass. The first named material makes the most lasting roof. If there is any roof leak, the remedy is simple. A piece of bamboo is split in two, the knots removed, making a clear and smooth channel; this is then fastened under the leak with the end projecting through the nearest side wall; the water runs down the bamboo-channel and get outside the house.

The space between the ground and the floor of the house is usually used for shelter to the domestic animals - pig, cow and goat. The fire woods and bamboos are also stored in the space. The raised houses protect the inhabitants from the ferocious wildlives.

Other construction works: However, larger bamboo culms are used for the piles, stilts and the major frame work. Small sized pieces are used for floors, windows and door-frames. The bamboos are slit into slats for weaving into mats. When the culms are split in half and the nodes removed they are used as structure of fence. The same indigenous application of bamboo is also carried through for furniture, fences, cages, mats, farming implements, ladders and binds. Water containers and other kitchen utensils are made of bamboo. People in the hills construct bamboo platforms and supports for cultivating the cucurbit vegetable *Momordica cochinchinensis* (bangla and local name: *Kakrol*).

Seed as food: The seeds of muli bamboo are big in size, 5-10 cm long, 3-6 cm wide,

onion size and somewhat fleshy. When seeds are available, sometimes, eaten as vegetables. The seeds of mitinga bamboo are small, look like wheat grain. During seeding time, seeds are also powdered and cakes prepared for eating.

Water can: Usually long internode of *dalu* bamboo is used for carrying water in the steep slopes.

Smoking pipe: A piece of culm of *B. vulgaris* having one internode is also occasionally used as a smoking pipe. Smoke passes through the water stored in lower part of the smoking pipe filtering it and making a pleasant sound.

Medicinal use of bamboo by ethnic people: To get cure from the bite of any animal, paste is prepared from the tip of very young culm of muli bamboo and put on the bite spot. When there is a deep cut/injury, the green muli bamboo skin is lightly scurf and put on the injured spot. Then it is covered by a bandage. Patient should drink water sufficiently. It helps in stopping the bleeding and joining the cut without any stitch. *Tipara* people locally called it *yeaha thia uchua*. Creamy colour white embryo of muli bamboo seeds is taken as medicine for strength.

Cow milk is poured inside the internode of *dalu* or *mita* bamboo and the open end is covered with *muli* leaves. Then the internode filled with milk heated over light fire for 10 minutes and then served as drink. They believe that the drink is an excellent health tonic for preserving youthfulness. The drink is known as *dulmuthoi chenai* (dul = *mosuk* milk means cow milk, muthoi = warm, chenai = dish).

Musical instrument: Bamboo musical instruments especially the flutes are known to almost every tribes. Flutes, the musical blown instruments, are usually made by one internode. *Mro* people call the bamboo flute as *Plu*. In Marma language this type of flute is known as

"*Wa-pre*". Bamboo dance is popular to *Lushai* tribe. A number of similar size 1.5 - 2.0 m long bamboo culms of *D. longispathus* or *M. baccifera* are used for dancing purpose.

Bamboo sticks: About 30 cm long and 4-5 mm in diameter bamboo sticks are sold in bundles at Bichitola market located on the Khagrachari - Rangamati Road. One bundle has 500 sticks and price is taka ten each. Monthly 10 million pieces are sold in the local market and purchased by some Bangali Traders and exports to the European countries. One person can make 6 bundle per day. About 500 - 600 families are economically dependent on the bamboo stick business. It is learnt that the sticks are used for supporting the pot plants in abroad. The bamboo sticks are usually made from *M. baccifera*.

Shoot as food: Bamboo shoot is edible but bitter. The tribal people of Bangladesh collect bamboo shoots from the natural forests and have been using them as one of the major food items during rainy season. A bamboo shoot is the new tender growth of the rhizome apex into a young culm consisting of compressed internodes protected by a number of leathery sheaths. The shoots are usually harvested when they attain the height of 15-50 cm. After removing the sheaths the inner tender portion or meat is thoroughly washed in water and then cut into pieces. The pieces are usually consumed as vegetable ingredients in curry or soup by mixing with fish or meat, and also as pickle. Shoots are also sliced and dried for preserving them. These dried shoots are eaten in off season. The shoots of *Bambusa polymorpha*, *Dendrocalamus longispathus* and *Melocanna baccifera* are somewhat slightly bitter to sweet in taste and pleasant flavoured at raw state. Among all the naturally growing bamboo species, the shoots of *M. baccifera* are commonly used as food by the local ethnic people of the hills. During

rainy season, that is in shoot emerging time, the shoots of *M. baccifera* are often sold in both temporary and permanent vegetable markets of these areas. Fairly acceptable taste and easy availability of shoots of *M. baccifera* made the species most common bamboo vegetable for the tribal people of Bangladesh. Moreover, the smoothness or less amount of hairs on the sheaths of this species is an advantage, since the types with hairs are difficult to handle. The hairs often tend to stick in the fingers as the sheaths are removed from the shoots. It appears that in *M. baccifera* two types of clumps exist in nature judged on the basis of emerging shoot characters. In one type shoots possess a yellowish culm-sheath and are usually preferred as edible shoots. In the other, the sheaths are comparatively deep brown and usually less favoured as food due to their bitter and astringency taste (Banik 1994).

Bambusa tulda produces shoots of very bitter to bitter taste and, therefore, it is not liked by the tribal people. Though *D. giganteus* produces big shoots, they are usually very bitter in taste and not eaten by the local people. *Schizostachyum dullooa* is a threatened (Banik 1994) bamboo species in the forests of Bangladesh. The shoots of this species are also bitter in taste and very rarely used as food. A similar bamboo species, *Schizostachyum pergracile*, occurring in Nagaland, Assam, Manipur, Orissa, Madhya Pradesh and Andhra Pradesh of India, produces shoots which are found with high cyanogenic content, and therefore, not edible (Tewari 1992). Next to *Melocanna baccifera* the shoots of *D. longispathus* are also taken as food due to its acceptable taste, texture and flavour. *B. vulgaris* has been found to produce bitter to slight bitter shoots. The bitter and acrid taste are usually removed by boiling in water mixed with little amount of salt for half an hour and followed with several washing.

Chili (dry or green), fish (dry or fresh), bamboo shoot, salt are thoroughly mixed inside the internode of *mita* or *dalui* bamboo by beating with a bamboo stick. The paste is served as sauce/pickle in the dishes. Tripura people called it as *moso pring chenai*. Vegetable and fish are mixed and put inside the bamboo internode and sometimes steamed over fire and then served as food.

Management practice for shoot production: In fact, the local tribal people usually do not harvest shoots continuously for more than 2 to 3 years from a bamboo clumps. After 3 to 4 years they move from the harvested clump to a new clump. However, they usually do not harvest all the shoots from a clump. They harvest selectively about 30 per cent to 40 per cent of the total number of shoots emerged in a year. They also opined that the selective harvesting improves the size and health of shoots which are left in the clump. Scientific study also approves the statement (Banik 1997). Selective harvesting of shoots from a bamboo clump, as practised by the local people, may be an important procedure for bamboo grove management.

Marketing of shoots: It was observed in Shanirvar bazar of Khagrachari that about 60 per cent vendors are women who have been selling freshly collected bamboo shoots in the market. In the beginning of the shoot production season the price of shoot per kg was found to be Taka 6 to 7. During on season of the production the price falls to Taka 2 to 3 per kg. and at the end of the season price rises to Taka 10 to 15 per kg.

Rattan shoot tip as food: The spiny skin of young stem of chikan bet is peeled off and the inner soft, tender creamy colour meat is cooked with prawn fish and serve as a delicious dish.

Rattan cane are generally used by the local people mainly for tying and binding purpose.

Medicinal use of rattan: The transparent sap water of rattan plant is sometime used as eye drop.

Conclusion

Little is known about the ethnobotany of bamboo and rattan. Exploration, collection and documentation of indigenous knowledge are urgently needed. This would guide in managing and utilising the natural bamboo and rattan resources of Bangladesh.

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Table 1. An improvised preference ranking of the value of different bamboo and rattan species in respect of homestead cultivation (5, most valuable; 1, least valuable)

Bangla name	Respondent (Ethnic group)							
	Bm	Mr	Mu	Tr	Ck	Tn	Total score	Ranking
Bamboo:								
Muli	4	3	2	2	3	3	17	c
Ora	5	4	5	1	5	3	23	b
Mitinga	3	2	3	3	2	2	15	d
Baizzya	4	3	4	4	5	5	25	a
Bhudung	1	1	1	1	1	1	6	f
Dalu	2	2	2	1	3	3	13	e
Rattan:								
Golak	1	2	2	1	2	2	10	b
Chikan	4	4	3	3	4	4	22	a
Karak	1	1	1	1	2	2	8	c
Bhutum	1	1	1	1	1	1	6	d

Ethnic group: Bm = Bawm, Mr = Marma, Mu = Murong, Tr = Tipara, Ck = Chakma, Tn = Tanchangya.

Table 2. Ethnic and Bangla name of different bamboo species growing naturally in Chittagong Hill Tracts

Scientific name				
Language	<i>M.baccifera</i>	<i>B. tulda</i>	<i>D. longispathus</i>	<i>S. dulloo</i>
Bangla	Muli bans	Mitinga bans	Ora bans	Dolu bans
Bawm	Mautak mau	Hrishing mau	Reenal mau	Reeteng mau
Chakma	Ekuzhabanz, Muli banz	Mitingabanz, Mita banz	Farwahabanz, Ora banz	Dhalo banz
Lusai	Mau hrua	Hrau naal	Hrau pai	—
Marma	Kaiang waah	Maade waah	Torugoo waah	Mhraw waah
Murong	Kawoo thum	Kawoo teen	Kawoo teu	Malau kawoo
Tanchangya	Paba baith	Mita baith	Aguiwaha baith	Dalu baith
Tipara	Hruthui yeaha	Eamrua yeaha	Eahamili yeaha	Dolorja yeaha

Table 3. Ethnic and Bangla names of different rattan species growing naturally in Chittagong Hill Tracts

Ethnic names					
Scientific name	Bangla name	Marma	Murong	Chakma	Tipara
<i>Calamus viminalis</i>	Karak bet, khorkhoijja bet	-	Riama	Karath	Hraichuk
<i>C. guruba</i>	Chikan bet, jayat bet	Kejune	Lung peen chahe	Moicha	Hrai bet
<i>C. latifolius</i>	Bhutum bet	Sain, krey kring	Soun poon	-	Laikrap
<i>Dendrocalamus jenkinsiana</i>	Golak bet	Choin	Soun pak	Golla	Golla

Conservation and Propagation Challenges of Bamboo and Rattan Resources in Chittagong Hill Tracts

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Introduction

The Chittagong Hills Tracts (CHT) is a well known tropical forest region of Bangladesh bordering two countries—Myanmar (Arakan province) and India (Tripura and Mizoram provinces). The CHT region has an area of 13191 sq. km., located to the south-east corner of Bangladesh, situated between 21°25' and 23°45' north latitude and between 91°45' and 92°50' east longitude. The 90percent of the area is hilly; 4percent covers villages, rivers, and marshes and remaining 6 percent is suitable for agriculture. Anthropologically the region is the abode of at least ten ethnic communities viz. *Chakmas*, *Chak*, *Lushai*, *Tanchangya*, *Maghs (Marma)*, *Tipara*, *Murangs (Mro)*, *Kuki or Lushai*, *Kumii*, *Pankhos*, *Barom* possessing distinct cultures and life style of their own. All these tribal groups are scatteredly inhabiting in the region. They are mostly forest dwellers and practice *jhumming* (shifting cultivation).

Natural bamboo forests

The naturally growing bamboos in Bangladesh are localized in the semi-evergreen and moist deciduous hill forests of Chittagong, Chittagong Hill Tracts (CHTs), Cox's Bazar, Sylhet and Northern Mymensingh in association with either tree species or as pure stand. The shade cast by bamboos is such that there is normally no undergrowth, but in the more open areas weeds develop to a varying extent. Bamboos generally invade the abandoned fields in the forest

areas after *jhumming*. The high temperature and humidity requirement are common characteristics of bamboos growing in the monsoon areas of south east Asia. The majority of bamboo species grow at temperature ranges from 7°C (sometimes 2-3°C) to 40°C. Rainfall is an important factor and 1000 mm seems to mark the minimum annual precipitation required. Gamble (1896) reported that distribution of bamboo in the subcontinent has been related to the rainfall, the most common range being 1270 mm to 4050 mm per annum. A number of species also found to grow in zones with over 6350 mm. Most bamboos are found in well drained, sandy loam to clay loam soils, derived from river alluvium of flat or gentle slope area. Soil pH about 5.0-6.5 is the most suitable for bamboo, some species may grow even at pH 3.5. Geologically younger soils are more suitable for bamboo than the older soils. A wide range of textural variation and soil depth, however, do not interfere in the normal growth of bamboo provided the drainage, rainfall and temperature requirements are favourable.

So far six species of bamboo have been found to grow naturally in the forests of CHTs. Among them *muli* (*Melocanna baccifera*), is the most common usually constitutes 70-98 per cent of the natural bamboo forests. The ecology and brief description of naturally grown each species of forest bamboos are given below (Banik 1994):

Muli (*Melocanna baccifera* (Roxb.) Kurz) is more or less an evergreen with single

culms arising 1 to 2 m apart from a ramifying underground rhizome. The young (less than 1 year old) culms with drooping tips having few leaves and nodes covered with sheaths are the common views of the *muli* forests during October to April. The species is naturally distributed throughout hills of Bangladesh and Myanmar from the Garo and Khasia Hills of India to Chittagong and Arakan. It is believed that the natural home of *muli* bamboo is Chittagong Hill Tracts where it grows gregariously covering large tracts of land (Prasad 1948). The species occurs as an undergrowth to many of the tree crops and also forms a pure stand by aggressive nature of its underground rhizome in areas after burning. It can grow under crown cover as well as in an open terrain. The plant thrives satisfactorily on the moist sandy clay loam alluvial soils and, also on the well drained the sandy rough slopes and the top hills. It indicates the hardy nature of the plant. *Muli* bamboo constitutes more than 90 percent of bamboo vegetation of the hill forests of Bangladesh. The natural habitat of this species has highest rainfall (250-600 cm per annum) in the world. This species with a net-like extensive rhizome system might have been selected naturally in the region for protecting the forest soil from erosion (Banik 1989). Thus, from ecologic, social and economic viewpoints, *muli* bamboo is an important bamboo resource for Bangladesh.

In some parts of the forest small sized clumps of *M. baccifera* have been found to occur naturally. The clumps are usually 5-8 m tall with many numbers of small diameter (1-3 cm at mid culm zone) culm. Locally this type of bamboo is known as *tengra muli/nali/bazali*. These clumps are found to regenerate successfully even in heavily burnt and grazed areas, and this bioform of *M. baccifera* might have evolved to adjust and survive in unfavourable conditions of nature.

Mitinga (*Bambusa tulda* Roxb.) is an evergreen or semi-deciduous clump forming naturally grown bamboo species. It produces branches freely from nearly all the nodes mostly from lower nodes. The branches from the lower nodes are thin, nearly leafless and more or less horizontal. It is commonly found to grow as an undergrowth sporadically or in patches. Sometimes it forms patches of a pure to semi-pure vegetation as observed near Matamuhuri stream in southern part of CHTs. This bamboo frequently grows on the flat alluvial deposits along the streams in the mixed deciduous forests and also along the banks of the dry water courses. As regards abundance this species is next to *Near the hilly areas muli*. It is also cultivated in the homesteads of Bangladesh.

Ora (*Dendrocalamus loingi spathus* Kurz) is a naturally grown large tufted bamboo with branches mostly in the upper part of the culms. The species is easily recognizable by its long fragile papery sheaths covering the internodes of younger culms. The species is rarely seen on the hill tops drier slopes. and also under the close canopy cover. It grows mostly along the streams in moist fertile loamy soil and partially shaded fringes of the forest cover. Rarely, it forms the small pure patches as observed in Koila block of Ramgarh, Rankiang Reserves of CHTs.

Dalu (*Schizostachyum dullooa* (Gamble) Majumdar, Syn. *Neohouzeaua dullooa* (Gamble) forms a medium sized clump with dark green culms growing in large tufts. The culms are whitish below the nodes, glossy when dry. The species is easily distinguishable by its very long (0.3 to 1.2 m) thin walled internodes covered with scattered shiny white appraised hairs. The leafy branches are switchy, in dense half-whorls at the nodes and less branching at the lower nodes. It is naturally distributed from Bhutan,

Assam, Bangladesh to Myanmar. It occurs on the moist, well drained and fertile valleys as an understorey in the deciduous forests. The species prefers shade and is not available on drier, open and scrubby hills.

Kali (*Oxytenanthera nigrociliata* Munro) is an evergreen and semi-deciduous medium sized tufted bamboo with comparatively smaller diameter, and is usually dark green in colour with the prominent nodes and internodes. The culm sheaths of younger culms are covered with blackish to brownish hairs. The species is characteristically plentiful in congested clumps in the fringes of moist semi-deciduous forests. It is usually found as isolated clumps in disturbed scrubby forests and drier hills. The species can tolerate the repeated cutting while most of the other bamboo species cannot survive under these conditions.

Lata (*Melocalamus compactiflorus* Benth.) is an evergreen tufted bamboo with greyish-green, scandent spreading and arching culms climbing on the supporting trees. The stem has distinct large buds at the nodes. The species is naturally distributed from Sylhet through Chittagong down to Martaban of Myanmar. At present, in Bangladesh the species is only confined to some areas of Teknaf forests bordering Myanmar. It thrives well near the bank of streams and moist valleys in the hills. Now-a-days, one can rarely find a clump of this species in the area mainly due to clear felling and burning of the forest for making plantation of oil palm and fast growing exotic tree species. The bamboo is used to make fans.

It appears that out of all naturally growing species, *lata* (*Melocalamus compactiflorus*), and *dalu* (*Schizostachyum dullooa*) bansh have now become threatened species in CHTs.

Forest bamboo areas

Kassalong, Rankhiang, Sangoo and Matamuhuri Reserves are the main bamboo producing areas in the large geographical region of Chittagong Hills Tracts. According to 1984 forest inventory Kassalong has 164448, Rankhiang has 241552, and Sangu and Matamuhuri has 74500 hectare of bamboo forest (De Milde *et. al* 1985). Presently the natural vegetation in the hilly areas are being destroyed and already vast hilly areas have been denuded. Previously, shifting cultivation cycle was used to be approximately 30 years. Presently, the cycle has been shortened to 4-5 years due to population pressure and scarcity of land. As a result, bamboo typical to the region are gradually degenerating in size and density. Bamboos are to be felled at three to four year rotations so that only older culms are harvested. But most of the time the felling prescriptions are not followed and the culms are cut irrespective of age. As a result of overexploitation and repeated felling bamboo forests have been degrading year after year. Gradual conversion of bamboo forests into plantations through clear felling and burning has been decreasing the areas of bamboo vegetation. It has been estimated that the average annual loss of bamboo area is 2.6 per cent (Banik 1993).

The gregarious flowering and monocarpic death are other natural causes of loss of bamboo forests. During last 40 years, almost all the bamboo species of the forests have flowered both sporadically and isolatedly. As a result many clumps died isolatedly or gregariously over a vast area of forest land. A bamboo species flower after a definite period of vegetative state. The flowering and large scale death of bamboos is in alarming situation for the bamboo resource. During last gregarious flowering of *M. baccifera* in 1956-61, Karnafuli Paper Mills suffered

from raw material shortage due to the large scale death of bamboo in CHTs. Presently, the species has started flowering again since 1985 in the area (Banik 1989). So it is likely to create similar shortage of bamboo resources in the coming years. After each gregarious seeding huge number of bamboo seedlings come up in the forest floor and thus bamboo plant regenerate naturally. Local people conserve and maintain some small patches naturally growing plots in hilly areas from generation to generation for sustainable harvesting. Very seldom this species have been cultivated in the homestead. People found to cultivate *D. longispathus*, *B. tulda* and *S. dulloo* in the homestead only near the streams in addition to the natural sources.

Rattan species

Rattan is one of the important natural resources of Bangladesh forests and homestead. Out of 11 recorded species from Bangladesh, more than two species are now not readily available. Either they have been greatly depleted or their habitats have been restricted. The rattan species are: *Calamus erectus*, *C. flagellum*, *C. floribundus*, *C. gracilis*, *C. guruba*, *C. latifolius*, *C. longisetus*, *C. tenuis*, *C. viminalis* var. *fasciculatus*, and *Daemonorops jenkinsiana*. In hill forests rattans are found to grow well in well-drained, moist, sandy-loam soils on the slopes. At present hardly any rattan clump in a climbing condition is found in the forests. Few clumps in a climbing condition occur in less accessible forest areas. In accessible areas, where any stem attains 5-8 m height, it is extracted by local people. No inventory of rattan resources in the forests has been made. Rattans are climber and climber on the tall trees of high forests. Due to the clears felling system rattan plants are also eradicated and destroyed. Like bamboos, rattans are also not being planted in the

hills by the Forests Department. However, a few clumps of different rattan species can be seen to occur near the moist sites in settled homesteads of tribal people. They cultivate and maintain the rattan plants for their personal construction works and sometimes the stems are sold in the local market.

Propagation and Management Practices for forest bamboos

Estimated ranges of flowering cycles of different bamboo species of Bangladesh were found to be within 20-80 years but the majority have 30-50 year cycles. *Melocanna baccifera* exhibit two different flowering cycles, one is 30 ± 5 and other is 45 ± 5 years. *Bambusa tulda* frequently flowers sporadically and may also exhibit gregarious nature of flowering after 20 ± 5 years. *Dendrocalamus longispathus* often flowers sporadically and also sometimes gregariously after 30 ± 2 years. Flowering in *O. nigrociliata* and *S. dulloo* is sporadic and also occasionally gregarious after 47 ± 3 and 45 ± 2 years respectively. However, local hill people believe that most of the bamboo species of CHT flower within 40-60 years interval.

Natural Regeneration

Given adequate protection, natural regeneration of bamboos occurs profusely after each gregarious flowering. Gregarious flowering starts at some point profusely after each gregarious flowering. Gregarious flowering starts at some point in the bamboo forest and gradually spreads in waves to cover the whole area in up to 3-4 years. Masses of fertile seeds are shed in the immediate vicinity of the clumps and they germinate profusely at the onset of rains. Seedlings are particularly numerous on bare or freshly exposed soil. Banik (1988) reported that the density of naturally occurring

seedlings of *B. tulda* and *D. longispathus* after one to two months was higher (about 45/100 cm²) in depressions and valley areas, and lower on the slopes (about 3/100 cm²). There is intense competition among the seedlings themselves, resulting in a natural thinning. Clusters begin to form in three to four years and in about six years or more, the area will have a homogenous crop of more or less evenly spaced-out young clumps.

It is reported that factors such as shade and weeds influence the density and survival rate of the regenerating seedlings. Bamboo seedlings are found to thrive better in partial shade and low-weed condition than in full shade and high-weed condition. Under full shade, almost all seedlings gradually degenerate. The influence of light is comparatively more important than weed competition to seedling health and mortality, at least in the early stages of growth. Felling of the dead mother clump within one to three months of seed germination is highly detrimental to the regeneration process. The effect is not so hazardous if light burning is done after the seedlings are at least nine months old, since the seedlings generally produce underground rhizomes after four to six months of age. Grazing is also a limiting factor for natural regeneration of bamboos. Combined with burning, or even alone if severe enough,

grazing can wipe out the entire seedling bank. In heavily grazed areas, seedlings may survive inside dead bamboo clumps and, in the absence of burning of the clump, eventually grow up into clumps.

Artificial Regeneration

Bamboo vegetation can be enriched and/or raised artificially by any of the following methods:

- * Direct sowing of seeds;
- * Raising seedlings in the nurseries and transplanting them;
- * Utilization of wild seedlings for artificial plantation;
- * Planting vegetative propagules, e.g. offsets, culm-cuttings, branch cuttings, and macro-proliferated seedlings etc.

Bamboo plantations may be raised in the denuded hills and degraded areas, logged-over forests and marginal farm land including homesteads. Under planting may be done in the well-thinned or widely spaced forest plantation.

Seed character: Seeds of bamboos are very different, both in size and weight depending on the species (Table 1). The seed of *M. baccifera* is large (onion sized) while in other species the seeds are small, grain like and wheat coloured. One full grown clump of muli bamboo produces 5-7 kg seeds during flowering time.

Table 1: Seed characters of some naturally grown bamboo species in CHTs of Bangladesh

Name of species	Seed shape and weight
<i>Melocanna baccifera</i>	Large and obliquely ovoid, thick fleshy onion-shaped and the apex terminating in a curved beak, green with smooth surface. The weight of a seed varies from 7.0 to 110 mm and diameter from 22 to 60 mm, 45 to 70 seeds (average) per kg.
<i>Bambusa tulda</i>	Small like wheat grain, 150 seeds (average) per 10 g
<i>Dendrocalamus longispathus</i>	Small like coriander seed, 1,350 seeds (average) per 10 g
<i>Oxytentera nigrociliata</i>	Small like wheat grain, 265 seed (average) per 10 g
<i>Melocalamus compactiflorus</i>	Like chest nut or betel nut. The weight of a seed varies from 2 to 20 g.

Seedling raising and nursery management :

Seed collection is a vital component since bamboo flowers irregularly. Mature seeds drop on the ground becoming exposed to predators such as birds, especially chickens and pigeons in the homesteads, and rats, porcupines and wild boars in the natural forests. Birds and squirrels also eat seeds on the plants. Seeds require careful protection and collection both from plants and the ground. Generally, seeds produced in the early part (mid February - May) of the season are healthy and more viable. Excepting in *M.baccifera*, glumed seeds of all other species can be separated from debris and empty seeds by floating in water. As the seeds of *M.baccifera* are big and not covered with glumes they can be separated easily from debris and unwanted materials.

Bamboo seeds germinate in a higher percentage under shade than in sunlight. Seed should be sown in the polythene bags just after collection. The germination media (soil and cowdung 3:1) should be wet but not waterlogged. Seeds start germinating within 3-7 days of sowing and continue up to 15-25 days.

The seed weight has a significant effect on the survival of *muli* seedling. *Muli* seeds can be graded in to three groups on the basis of weight. The light weight (7-16 g) seeds are usually not desirable for better nursery stocks. Seedlings survive up to 70-75 per cent when raised from the seeds heavier than 50g, while it drops to 56 per cent when raised from light weight seeds. Bamboo seeds are short lived, losing their viability within one-two months (Banik 1987a). *Mitinga* seeds can be stored to 18 months by storing over silica gel in a desiccator. At normal room condition the life span of *muli* seed is about 35 days. It can be increased up to 45 days when stored in an air conditioned room. The seed longevity can further be prolonged to 60 days when stored with dry sand in jute bags. Initially, seedlings do best in

partial shade compared to direct sunlight. Complete shading over the seedling should be discouraged.

In the nurseries roots and rhizomes of seedlings penetrate the neighbouring polythene bags of other seedlings. This creates a mass of twisted and intermingled roots and rhizomes of seedlings. As a result, the roots and rhizomes are damaged at the time of transportation. Frequent shifting of seedlings from one bed to another helps in minimising the root rhizome intermingling at nursery stage. Seedlings need regular weeding and daily watering at nursery stage.

Wild bamboo seedlings look like rice or wheat seedlings should be thinned out and collected. They are transplanted in the polythene bags containing soil mixed with cow dung and kept under shade for three to five days for hardening. Then the seedlings are to be placed under partial shade. Two to four leafed stage of wild seedlings of *B.tulda* and *D.longispalhus* are the best for collection, while in *muli* germinating seedlings are best.

At present seeds of *muli* are available from the sporadic flowering and the reforestation of bamboo seedlings can be geared up. Within the next 10 years these seedlings would produce merchantable culms and can compensate the future shortage of bamboo. Therefore, raising of *muli* plantation should be started immediately in the hills of CHTs, Chittagong, Cox's Bazar, Mymensingh and Sylhet. The natural regeneration of wild seedlings need to be maintained and monitored for restocking of the bamboo forests.

Offset plantings : Bamboos are conventionally propagated by offsets. An offset is the lower part of a single culm (usually 3-5 nodes, i.e. about 1.25 m) with the rhizome axis basal to it and its roots. The culm is between one and two years old. Offsets are normally obtained and transplanted just before the rainy season

or after a pre-monsoon shower, i.e. from mid March to April. If collected later, when culms are emerging, the buds on the rhizome will be elongated and liable to damage and as a result the offset will fail to survive in the field. Offset planting success in these forest bamboo species is relatively poor and varies greatly from species to species. The offsets are bulky and heavy (4-30 kg per propagule) and therefore, difficult to handle and transport. Availability of propagules per clump is also limited and costly. Therefore, this method has limitation for large-scale bamboo plantations (Banik 1987b, 1995).

Besides the offset method, other techniques of vegetative propagation for bamboos are prerooted branch cuttings, culm cuttings, layering, macroproliferation of seedlings, etc. Among them branch cutting and culm cutting techniques are easy and can be used for producing bamboo propagules.

Branch cutting : Most of the thick-walled cultivated bamboo species in Bangladesh have stout branches having spontaneous *in situ* rooting and rhizome at the swollen base (Banik 1980, 1987b). Aerial roots and rhizomes of such cuttings are not always fully active. Therefore, these cuttings have to be collected from the nodes of the standing culms during April to June and be placed in the sand media of propagation beds. A propagation bed is a 3-l ayered sand rooting media. Each of the layer is 7-10 cm deep. The base layer is made of gravel and large sized sand, the mid layer consists of medium sized sand and the top layer is made of fine sand.

The collected branch cuttings from the culms are placed on the sand media under mist for one month. Within 30-45 days, each of the prerooted and prerhizomed branch cuttings produce profuse active roots!

Culm cutting : These are culm segments having 1 or to 2-3 nodes with buds or

branches. The culm selected for the cuttings should be not more than 2 years old and buds should be healthy. The cuttings placed in the sand propagation bed for rooting. About 30-70 per cent success can be obtained depending on the species.

In *Dendrocalamus longispatus* success can be enhanced in both branch cuttings and culm cutting treatment by treating them with IBA or NAA (100-150 ppm).

Once rooted, the cuttings are transferred to polythene bags and kept in the nursery. It needs regular weeding and watering of the cutting in the nursery. Like seedlings, cuttings are kept in the nursery at least up to the next monsoon. Survival of these types of cuttings in the field is high, almost 85-90 per cent.

Macroproliferation of seedlings : Both artificially and naturally raised seedlings can be multiplied by rhizome separation. One five-month old *mitinga* or *ora* seedling may yield three to five multiplied seedlings. Thus, every year bamboo seedlings can be multiplied to increase the number. However, *muli* seedlings can not be multiplied because the species usually possess one stem up to nine months of age. For better survival (about 80-90 percent) in the field, less than one-year old seedlings should not be transplanted. The seedlings are to be planted out during the rainy season.

Tissue culture: Bamboo can be multiplied through **tissue culture** technique. The results and the success of tissue culture research on different forest bamboo species is limited. The medium used for the culture has mostly been the MS Medium, and sometimes on other medium such as B5. Both solid and liquid medium were used supplemented with BA, Kn, 2ip as cytokinin and IBA, NAA as auxin. Direct proliferation as well as callus culture were possible. Better success has been obtained with the juvenile

(seedling) materials. The application of the method of micropropagation is, however, still limited since the proliferation and rooting of vegetative explants (mostly buds) are relatively poor. Further research has been going on.

Field planting and maintenance: The following factors need to be taken into consideration while selecting planting site :

- Bamboos do not survive under deep shade.
- Bamboos do not survive in water logged conditions.
- Planting site should be welldrained, moist and preferably rich in organic matter.
- North-west part of the homestead is the most desirable site for bamboo because the planted clumps act as wind break.
- New canal banks are also good sites.
- Lower slopes of the hills are good planting sites, upper slopes have to be avoided.

Usually, June to August are the best months for planting bamboo seedlings and cuttings. However, offsets need planting just after collection, therefore April-May is the best time for offset planting.

Pits of 30 cm³ are dug at 5m x 5m spacing. Therefore, in a hectare, 400 propagules are necessary. In the hills, planting pits are dug by spot weeding. No clear felling is necessary. Pits are to be filled with cowdung (4-5 kg), urea (10 g), triple superphosphate (10 g), murate of potash (5 g) and soil one week before planting. If there is no rain, watering is preferable just after planting especially in the homesteads and marginal lands. In the hilly forest lands watering is not possible. So, planting should be done in the rainy days.

After planting in June-August, three weedings and vine cuttings are done in the first year, and two in the second year. Weeding may be avoided by cultivating the legume crops (*arhar*, *bogamedula* etc.) in between the planting rows. Mulching around the planted seedlings / cuttings has to be done after soil work, before the annual drought period.

Propagation and Management Practices for Rattan Plants

Propagation by seeds is easy and simple provided that the seeds are extracted at maturity and sown immediately. Soon after collection, the fruits were depulped and soaked in water for 48 hrs to induce fermentation. The clean seeds settled at the bottom are removed and kept for stratification in moist saw dust for two, three weeks. The seeds are then transplanted to polybags filled with soil and sand (3:1). A thin layer of saw dust (about 1 cm thick) is spread on top of the polybags to retain the moisture content. Seeds start germination within four to eight weeks. Due to the uncertainty of seed availability, insufficient quantity and the problems involved in seed storage, rattan plants can be propagated by using suckers, or stem cuttings.

Planting of rooted suckers during the monsoon has been found promising. Layering under natural conditions has also been observed. The aerial stems flop over and produce roots when they come in contact with soil. Gradually they may develop into new plants.

Rhizomes and offsets are also suitable for propagation.

Field Planting and Management of rattans : One year old seedlings bearing 4-5 leaves can be transplanted with a ball of earth during the rains. The planting area should have scattered tall trees to provide partial shade and supports. Trees

with small crowns are desirable. Therefore, plantations after second thinning may be selected for underplanting of rattans. Seedlings should be planted in strips about 6-7 m (20 ft) apart. The young plants do not require much light at first but after the second year more light may be provided by clearing around the plants. After this plants begin to climb the trees.

Conclusion

Both bamboos and rattans are only harvested from the natural forests of Bangladesh and not being replanted. Therefore, enrichment planting and raising of new plantations of bamboos and rattans are needed urgently. It is evident from the above discussion that these resources are being conserved and sustainably utilized by the ethnic people in their settled areas and homesteads. Therefore, participatory approaches for planting and conserving the resources are emphasized.

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