

CHAPTER-5

Forests of Northeastern India—Prospects and Constraints on Utilisation

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Forests are primarily important for timber and also for minor forest products. Apart from direct uses of forests, forest cover is also important indirectly for conservation of soil, aesthetic beauty of the landscape, etc. Northeastern region of India supports very rich forests falling under deciduous to alpine types. These forests are again composed of innumerable kinds and varieties of plants. In fact approximately about 50% of the total Indian flora is represented in this region. Naturally, an enormous amount of wealth of timber plants, medicinal plants, oil yielding and other economically important plants lie in this region. In spite of the richness of the vegetation, flora of this region remains largely unexplored, which hinders the full exploitation of the natural resources.

Location and Physiography of the Area

The area under report falls between the latitudes 22° and 28°18' north and longitudes 89°46' and 97°4' east and covers an area of approximately 25,3810.20 Sq. Km. It includes Assam, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura and Meghalaya. The region is surrounded on three sides by four countries — Bhutan and China on the north, Burma on the east and Bangladesh on the west and south. Only through a narrow corridor in the west (Siliguri) it is connected with the rest of country.

Broadly speaking the hills of the Northeastern region constitute part of the mountain wall formed by the Himalayas. Situated on the

eastern flank of the Himalayan range, the western part of Arunachal Pradesh has the highest mountains with altitudes varying from 1219 m to 7090 m. The Sela range is prominently situated between Tawang and Dirang Dzong in Kameng. In Lohit the steep massive ranges and spurs are heavily scarred with large landslides as a result of 1950 earthquake.

Arunachal Pradesh is intersected by large riverbeds which after coming down from steep mountains spread out over extensive areas. Majority of these rivers in the western part run from east to west, but from Kameng river onwards almost all rivers flow from north to south.

Nagaland is bordered on the east by the Naga range. Saramati is the highest peak with 3826 m on the Naga range. The country rock is hard, slaty and on weathering gives rise to very rugged topography. Serrated ridges dotted with dense forests are found to alternate with deep valleys enclosing fast flowing rivers.

The total area of Manipur is 22,330.18 Sq. Km. of which 1553.94 Sq. Km. constitute the valley and the rest is the hilly region. The general direction of the hills is north and south and altitude ranges from 792 m to 2995 m. The drainage of the territory is from north to south.

Tripura has predominantly hilly terrain, running north-south. The altitude varies from 20 m to 650 m. There are numerous sand hills in this territory.

In early Assam including Meghalaya, out of 4 autonomous hill districts, 3 districts — Garo Hills, United Khasi and Jaintia Hills and Mikir and North Cachar Hills together constitute the Shillong plateau, the western end of which attains 1412 m at Nokrek peak and 1961 m at the Shillong peak in centre.

Climate

The region experiences heavy rainfall, frequent flood and landslip. The average annual rainfall in the sub-Himalayan ranges in Assam, Manipur and Tripura is 300 cm. The temperature in parts of Arunachal Pradesh varies from below freezing point in winter to over 26.7°C in summer. The climate of the hill areas of Assam is characterised by coolness and extreme humidity. In Nagaland during winter, the climate of the higher hills is cold and bracing. The days are generally bright and sunny but frost at night is common. The low ranges of hills that adjoin the plains are far from healthy. The average

rainfall at Kohima is only 13.5 cm. In Manipur the temperature varies 33°C to 39°C, but in Tripura a tropical climate prevails.

Soils

The soils of the hill districts of Assam contain a high proportion of nitrogen and organic matter. Manipur is composed mainly of tertiary rocks and the soil is mostly clay to clay-loam. Near Burma border the soil is sandy loam and places with laterite soils are also met with. The soils of Tripura are unpromising. They are light, except where silt has accumulated in the river valleys and virtually devoid of humus. This is true even in the forest areas because of the perpetual burning in the course of shifting cultivation. The physical composition of the soils is loose and porous, so that it cannot hold water. On the exposed uplands the soils are deficient in nitrates, phosphorous and potash and are acidic (Table 1).

Table 1.
Soil Types of Northeastern India

Alluvial soil	Parts of Assam, Tripura	Red, deficient in lime, vary from clayey to sandy loam and are generally acidic.
Laterite	Parts of Assam, foothills of Nagaland, Meghalaya, Mizoram and Tripura.	Derived directly from the residuary rock. Soils are deficient in potash, phosphoric acid and lime.
Ferruginous soil	Arunachal Pradesh, Manipur, parts of Meghalaya, Mizoram.	Poorer in lime, potash and iron oxide, nitrogen and phosphorous and humus. The clay fraction of the red soil is rich in Kaolinitic type of mineral.
Forest soil	Assam, Tripura, Mizoram and Meghalaya.	The soil appears to be of fine texture, resembles brown earth.

		The surface layer consists of well decomposed humus and mineral soil which shades off gradually and at varying depth into the colour of the parent rock and are strongly acidic.
Mountain and Hill soil	Assam, Manipur, Meghalaya and Tripura.	Percentage of organic carbon of the surface soil is about 3 to 1. 1 and pH is 4.5-6.5.
Mountain Meadow soil	Assam, Arunachal Pradesh and Nagaland.	This occurs above the timber line and below the snow line. Lithological in nature and subject to dislodgement due to slides and slips.

Forest Types

The richness of the vegetation cover of Northeastern India is well known and has been studied by various botanists and foresters (Hooker, 1834, 1872-97; 1906; Griffith-1847; Clarke-1889; Bor-1938; Biswas, 1941, 1943; Kingdon Ward, 1960; Das, 1942; Burkill, 1925; Fishcher, 1938; Deb, 1960; Kanjilal *et al.*, 1934-40; Champion, 1936; Rowntree, 1953; Rao and Panigrahi, 1961; Rao, 1974). Various types of forests are met with in these areas and each type is again characterised by a profusion and variety of species. Hooker (1906) remarks on the vegetation of Khasi Hills in Meghalaya as "the richest in India and probably in all Asia". Phytogeographically also the vegetation of this area is very interesting where there is an admixture of Asiatic and Indian peninsular flora. This great diversity and richness of flora is mainly due to its physical geography coupled with varied nature of rainfall, temperature and altitude. But in spite of the richness of the flora, the flora and vegetation of this region remains largely unexplored. (The forests of Northeastern region based on the altitude can broadly be categorised under: (1) Tropical type (2) Temperate type and (3) Alpine type.)

Tropical Forests

The tropical forests are met within areas between 900 m to 1800 m and comprises of evergreen and semi-evergreen forests, moist and dry deciduous forests, grasslands, subtropical mixed forests and subtropical pine forests, the latter chiefly confined to Khasi and Jaintia Hills of Meghalaya and Rupa valley of Arunachal Pradesh.

Evergreen and Semievergreen Forests

These forests are confined to Assam valley, lower elevations of Khasi Hills, Naga Hills and Arunachal Himalaya (Kameng, Subansiri, Siang, Lohit and Tirup districts). The rainfall is generally very heavy. These forests are characterised by dense and impenetrable vegetation chiefly comprising of tall, evergreen trees showing storied nature. Climbers and lianes are very common here on the top of the tree canopy.

The highest storey consists of very tall trees belonging to *Dipterocarpus turbinatus*, *Canarium resiniferum*, *Artocarpus chaplasha*, *Eurhoria longana*, *Kayea assamica*, *Mesua ferrea*, *Castanopsis indica*, *Dysoxylum binectariferum*, *Phoebe goalparensis*, *Terminalia chebula*, *Ailanthus grandis*, *Stereospermum chelonoides*; *Terminalia myriocarpa* and species of *Ficus* and *Quercus*. However, it is to be noted that not all these species occur in one all same place. Species of *Sterculia*, *Phoebe*, *Dysoxylum*, *Gmelina* and *Pterospermum* form the dominant species in Chirang Reserve Forest, while *Mesua ferrea*, *Amoora wallichii*, *Artocarpus chaplasha* and *Lagerstroemia speciosa* constitute the evergreen forests of Assam. Similarly, the foothills of Kameng district are dominated by species belonging to *Ficus*, *Quercus*, *Sterculia* and *Terminalia*. The lower storey consists of *Amoora wallichii*, *Ficus rumphii*, *Lagerstroemia parviflora*, and species of *Terminalia*. In many places, where there is a very wet monsoon for 4-5 months, there is admixture of evergreen and wet deciduous trees. These tall trees are bestowed with innumerable climbers and lianes, belonging to species of *Bauhinia*, *Acacia*, *Derris*, *Gnetum* and *Calamus*. Epiphytes in general are too numerous and mostly belong to orchids, ferns and mosses. The important orchids belong to the species of *Dendrobium*, *Pholidota*, *Coelogyne*, *Bulbophyllum*, *Saccolabium*, *Eria*, and *Cymbidium*.

The herbaceous monsoon flora of these forests is very rich and forms a striking feature when in bloom. The chief among them are

Impatiens, *Pouzolzia*, *Elatostemma*, *Curcuma*, *Bosenbergia*, *Phrynium capitatum* and *Costus speciosus*. The stem clasping epiphytes of *Aeracean* members, chiefly *Pothos* and *Rhapidophora*, also are not uncommon in these forests. Fern flora, both epiphytic and terrestrial, is also very rich in this type of forests. In some places tree ferns are very common.

Tropical Moist and Dry Deciduous Forests

These forests are much disturbed and include such economically important species as *Shorea robusta*, *Tectona grandis*, *Pterocarpus marsupium* and others both as natural and as plantations. The forest of Tripura, Goalpara, Kamrup, Nowgong and Darrang in Assam, parts of Meghalaya are ascribed to these forests. The principal trees in these forests are *Careya arborea*, *Gmelina, arborea*, *Dombax ceiba*, *Terminalia tomentosa*, *Duabanga grandiflora*, *Sterculia villosa*, *Dillenia indica*, *Kydia calycina*, *Garuga pinnata*, *Lennea coromandelica* and species of *Albizia* compared to evergreen forests, the climbers are very few here and belong to *Vitaceae*, *Menispermaceae* and *Papilionaceae*. Many of these deciduous forests merge into 'Savanna' forests in some place. The typical grass species belong to *Saccharum*, *Phragmites*, *Arundo* and *Erianthus*, which are all very tall grasses. There are a few trees belonging to species of *Vatica*, *Ficus*, *Antidesma*, *Artocarpus* and *Ziziphus*, which are scattered in these grasslands. However, many of these savannas are not climax types since the climatic and edaphic conditions in these areas supported either moist deciduous or evergreen forests which are degraded to the present grasslands.

Annual forest fires are of very common occurrence in these deciduous forests, specially during March and April, and destroy extensive tracts of vegetation.

Sub-tropical Pine Forests

This type of forest is met within areas of Khasi and Jaintia Hills in Meghalaya and in Rupa valley of Kameng district in Arunachal Pradesh. While it is *Pinus Kesiya* species in Meghalaya. *P. Wallichiana* is the dominant element in Rupa valley. These pine forests provide a shelter for a variety of herbaceous species underneath. Chief among them are *Trifolium repens*, *Desmodium* spp., *Osbeckia crinita*, *Hypocoeris radicata*, *Artemisia* spp., and in higher elevations the ground flora is dominated by *Eupatorium* spp. *Acginitia indica* a curious member of *Orobanchaceae* is also common in some places

among Pine litters. *Schima wallichii*, *Myrica esculenta*, *Acacia mollissima* *Alnus nepalensis*, *Quercus* spp., and *Engelhardtia specata* are the chief tree species in these pine forests of Meghalaya (Rao & Kharkongor, 1979); while *Pinus wallichiana* in Rupa valley is associated with *Rhododendron arboreum* *Quercus griffithii* and *Berberis* sp. The pine forests in Subansiri and Lohit are more of temperate type than of subtropical type.

Temperate Forests

The temperate forests are confined to elevations from 1800m to 2500m and occurs chiefly in Shillong plateau, in Naga Hills, Mizo Hills, Mikir Hills and in Arunachal Himalaya. Species of *Acer*, *Juglan*, *Rhododendron*, *Quercus*, *Betula*, *Michelia* and *Magnolia* characterise these forests, specially at Arunachal Himalaya.

The relic vegetation in some 'Sacred forests' of Khasi and Jaintia Hills represent the true temperate vegetation which once covered the entire area and is now considerably degraded due to human activities. Comparative studies on the vegetation of these sacred forests with that of adjacent areas gives us an indication of the extent to which these forests are degraded. Also much of these forests are now replaced by pine forests, mainly due to human activities from the prehistoric times. The trees in these sacred forests mainly belong to species of *Quercus*, *Castanopsis*, *Photinia*, *Eriobotrya*, *Engelhardtia* and *Mahonia*.

The branches of these trees are heavily moss laden and support a dense growth of orchids and ferns, the forest floor is covered with a thick mat of litter among which various herbaceous species are common. *Vaccinium* species, an epiphytic shrub is very common on the tree trunks here.

Sub-alpine and Alpine Vegetation

This type of vegetation is confined to higher ranges from 3000 m to 4500 m in Aka Hills of Kameng, Upper Delei and Dichu valleys in Lohit, and in Manipur. *Abies* species, *Juniper* species, and *Berberis* species, are common here. With the rise in altitude from 4500 m to 5500 m, these sub-alpine forests gradually merge into alpine forests where there is no tree growth and only a few hardy, perennial, herbaceous species with deep rootstocks constitute the vegetation. Such species belong to species of *Primula*, *Rheum*, *Arenaria*, *Saxifrage*, *Sedum* and some lichens. The alpine vegetation occurs in higher elevations of Arunachal Himalaya.

Prospects and Constraints on Utilisation of Forests

The forests of the Northeastern states offers a stable source of revenue to the states, if properly exploited/utilised. Apart from the valuable timbers, the forests here are also a source of a large number of minor forest products. The extent of revenue from minor forest products in different state of Northeastern India is given in Table 2. The forests in this region can be tapped for gums, resins, terpentine, etc. In Meghalaya, for example, there is a good scope for terpentine industry as there are good pine forests.

Table 2
Revenue from Minor Forest Produce*

(in lakh rupees)

	1967-68	1968-69	1969-70
Assam (including Meghalaya)	131.76	128.69	174.79
Manipur	2.87	2.93	2.44
Nagaland	3.27	4.34	4.17
Tripura	4.99	5.71	6.25
Arunachal Pradesh	14.05	14.10	14.10

*Source : Anonymous (1976)

Majority of the population here lives in the interior forest areas and so forest utilisation will also have to be planned in such a way as to bring an immediate economic relief to the local inhabitants. But there are some intermediaries who are gathering many minor forest products such as cassia leaves and bark, agarwood, canes, bamboos and broom grass from the local people at very cheap rates and export to far off places making a good profit. In order to prevent this and to bring an economic relief to local people, it is necessary that forest departments in each of these states should establish co-operative societies, through which such transactions can be done. It is through such organisations by employing the local people, the minor forest products can be gathered and exported to other places.

Cottage industry based on local products like bamboo, canes and other things can flourish in a number of places in the entire region. There is a great variety of bamboos and canes, specially in Arunachal Pradesh and Assam, which should be exploited properly. Assam has

probably the biggest bamboo reserve (*Dendrocalamus hamiltoni*) contributing to about 42% of India's total output. Preparation of decorative articles using the waste pine cones (as it was recently exhibited by one of the artists of the Botanical Survey of India) can form a flourishing cottage industry in Meghalaya and Arunachal Pradesh.

There are also prospects for establishing plant-based industries in this region. For example, Industries like particle board in Tripura, Assam and Nagaland; turpentine and agarwood oil in Arunachal Pradesh and Meghalaya. Some plant based industries such as plywood industry in Lohit, Tirap and Burnihat and paper mills in Kameng, Nagaland and Assam have already been established in this region and are promising.

The forests of this region has been a centre of origin of many of our cultivated or economically important plants including banana, sugarcane, paddy, chilly, tea and many other vegetable crops. Even today an intensive search for wild relatives of our cultivated plants in this region is sure to yield many more germplasm stocks which can be used for hybridisation work, etc. for improvement of cultivated plants. An effort towards this has already been made by the I.C.A.R.

There are a number of medicinal plants in this region used by the local tribals. It is not possible to list out all these plants here. But the emphasis is that there is a good prospect for ethnobotanical studies by which many interesting medicinal plants can be brought to light.

In the interior places of Arunachal Pradesh, there are some reports that the tribal people use some plants which are said to be very effective in causing abortion or antifertility activities. Efforts should be made to find out these interesting plants, which may be exploited properly. By employing the local people many such medicinal plants can be gathered in bulk and supplied to firms/industries dealing with extraction of alkaloids for preparation of medicines. But all these can again be operated through Forest Co-operative Societies or by a separate wing of the Forest Department itself. While this ensures employment to local people, also brings revenue to the state.

Orchids which are well known for their showy flowers are prized all over the world. It is again here in this region a large majority of these species grow. Out of about 1500 species, about 600 species of orchids grow in this region. Collection of orchids from wild growth, and their cultivation and multiplication has an immense scope and sure

to yield good foreign exchange. Orchid stations like the one established by the Arunachal Pradesh Government at Tipi, near Bhalukpong, are necessary in almost all the states, in order to exploit the orchid wealth effectively. Similarly Rhododendrons of different varieties with showy flowers are plentiful in this region and offers excellent scope for establishing such stations.

In spite of the tremendous amount of vegetable wealth in the Northeastern region, it has not been possible to exploit the resources to the fullest extent possible. There are many reasons for this. First, many of the forests in this region are owned by the private individuals or communities. For example, out of 8,500 sq. km. being the forest area of Meghalaya, only 900 sq. km. is covered by reserve forests. Similarly, out of 60,000 sq. km. area of forests in Arunachal Pradesh only about 7000 sq. km. is under reserved forests, the rest being owned by private individuals and unclassified forests. This private ownership of forests seriously hampers the exploitation of natural resources.

The second serious factor is that we do not have a full knowledge of the flora of the region. The distribution pattern of economically important species, their habitats, growth period, etc., are of fundamental importance for an effective utilization of these species. Though efforts are being made to bring out a flora of this region ever since the reorganisation of the Botanical Survey of India, the flora remains largely unexplored.

Another factor which stands in the way of effective utilization of forests is the lack of proper communication, specially in the interior regions of Arunachal Pradesh, Nagaland and Tripura. This coupled with lack of expertise in the field is a serious problem.

The major factor which stands in the way of effective utilization of forest resources is, however, the destructive factor to the forests. There are many factors responsible for the depletion of natural resources. 'Jhumming' or shifting cultivation is a primitive type of agriculture practised extensively in this region. Jhumming involves the clear-felling of the forest trees, and allowing them to dry and before the onset of monsoon the entire area is burned for cultivation. After cultivating the land for 2 or 3 years and then when the yield decreases the area is abandoned and the people select some other forested area and repeat the process. Earlier the cycle of Jhumming used to be around 25 to 50 years, but with the increase in population the cycle has come down to 5-8 years with the result the forests are being cleared off

at a very fast rate, and in the course of time giving rise to bamboo forests. Thumming cannot be prevented by law also, since much of the forests are owned by individual communities or tribes.

Increasing urbanisation, road building and industrial activities, increasing exploitation of forests to meet the increasing demand for construction material, newsprint etc. have all brought about indiscriminate clearing of forests, without taking any measures to restore the forest growth. This is high time that every one of us should think and do something on this line before the situation reaches a stage, when it can never be reversed, as it has happened in the case of some highly industrialised nations of the world.

A series of problems are connected with this loss of forest cover. Loss of forest cover in the catchment areas causes floods and renders the agriculture lands in the valleys infertile. Deforestation also leads to desertification or destruction of habitats of many species which may be endemic or economically important. Orchid flora, for which the Northeastern region is so proud of, is being reduced considerably. Many beautiful orchids which once were very dominant have now become very scarce. *Paphiopedilum venustum*, *Dendrobium nobile*, *Vanda coerulea*, *Coelogyne cristata*, and *Cymbidium elegans* are only a few to mention, (Rao, 1979). Hooker reports in one of his works (1854) that he could collect 7 mens' headload of *Vanda coerulea* (Blue vanda) in a day's collection for planting in Kew garden. But today it is very difficult to find a dozen of these plants in any given place. Added to this, the orchids are collected indiscriminately by the local people and sold to tourists/visitors at very cheap rates. With the result the orchid population has decreased considerable in these areas. It is not exagarating to mention here that most of the beautiful orchids of Meghalaya are growing today in Sikkim forest nurseries.

A suitable remedy for all these problems seems to be public education which can only make the people conscious of the devastating effects of forest denudation.

Conclusion

Northeastern region of India is bestowed with dense natural forests which can be broadly classified into tropical, temperate and alpine types. These forests are a rich source of income by way of many minor forest products, apart from the valuable timbers. However, there are many constraints on their full utilisation because of lack of botanical knowledge of economically important species of proper

communication, and indiscriminate collection of plants without making any efforts to restore their growth, and many other injurious factors to forests itself.

Public education can only bring a proper solution to all these problems. It should be understood that forests should be exploited only to such an extent that the habitat is not disturbed significantly, and forest growth is replenished simultaneously.

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