Report of the IFAD Reconnaissance Mission

Forestry Development in the North Eastern Region, Meghalaya, India

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ABBREVIATIONS

ADC	Autonomous District Council
CCF	Chief Conservator of Forests
DCFD	District Council Forest Department
DIC	District Industries Center
FCA	Forest Conservation Act
FSI	Forest Survey of India
GOI	Government of India
HPC	Hindustan Paper Corporation
INBAR	International Network for Bamboo and Rattan
IDRC	International Development Research Center
JMF	Joint Forest Management
NEHU	North Eastern Hill University
NEC	North Eastern Council
NEITC	North East Industrial and Technical Consultancy Organization Ltd.
NFP	National Forest Policy
NGO	Nongovernment Organization
NTFP	Non-timber Forest Produce

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EXECUTIVE SUMMARY

The forest cover in the North Eastern Region in India has been rapidly decreasing due to indiscriminate felling for timber and intensified shifting cultivation (jhuming). At the same time large proportions of the rural populations live in poverty. In Meghalaya, where the forests cover close to 70 percent of the area, the decrease of the forest cover due to shortening jhum cycles is estimated to have resulted to a net loss of 57,000 km2 in 1995-97. The standing stock is degenerating, biodiversity is being lost and valuable Non-Timber Forest Produce (NTFP) is being depleted. Loss of soil nutrients, soil erosion and increasing landslides affect the production of food crops and infrastructure. The livelihoods of the rural populations are threatened.

Yet, if properly managed, much of the forestland has a potential to grow a wide variety of valuable tree species. Introduction of multipurpose forestry to produce a mix of products, such as timber trees with different rotations, bamboo, and NTFPs, including rattan, broom stick, mushrooms, honey, aromatic and medicinal plants etc., would provide the rural communities with good cash earning opportunities, and enhance their livelihoods. Biodiversity would be increased, and diversification of production would minimize the risk of market failure of a single crop or product.

Meghalaya also has a rich bamboo flora with 20-30 species already providing basic needs for a large proportion of the population, as well as exports, currently mainly raw material for pulp and paper mills. Rattans are abundant below 1,000 m, although little is know of their identities, distributions and extent, nor of propagation techniques for the Meghalayan conditions. Bamboos are easy to incorporate and manage under the conditions in Meghalaya. It appears that neither potential supply of the raw material nor potential market demand are constraints to development of the bamboo resource in Meghalaya, but increasing supply of rattans seems to involve intrinsic difficulties.

The present status of the forestlands in Meghalaya, and widespread rural poverty indicate lack of sound practices for sustainable forest management and utilization. Only a fraction (four percent) of the forestlands in Meghalaya are State-owned. The present forest administration does not have the resources and capabilities to provide extension services to the privately owned and communally controlled forests. Enhancement of the livelihoods of the rural communities, which to a large extent rely on intensified jhuming for their food production, requires addressing the major issues hampering sustainable forest utilization in the North East. They include land tenure, which is based on customary practices and laws, and does not provide documentation on the various forms of ownership and control. The capacity constraints and institutional development needs of the forest administration, including the role of the Autonomous District Councils, need to be reviewed and addressed. An extension service capable of reaching the indigenous rural communities should be established. Other issues, such as complexity of the forest policies and legislation covering the States in the North East, need to be reviewed, and regulations simplified, if necessary.

The model of community natural resource management in upland areas currently being tried out under the on-going IFAD Project for the North Eastern Region appears replicable. Once more experience is gained, it can properly be assessed whether land use planning and development of livelihoods of the rural poor through broad-based village organizations (natural resource management groups) is feasible. It, however, appears that the natural resource management groups provide a good forum for developing sustainable forest-based activities. Processing and marketing can be developed through Self-Help Groups, since linkages to the various service providers, which provide skill development, credit, etc. can be established more easily through groups.

Sectoral development and design of a potential investment project for IFAD-financing to develop sustainable forestry for the North East, and Meghalaya, would benefit of further investigations on the major issues. These could include the following:

(i) a review of the land tenure situation, with recommendations for formalization of the tenure arrangements, and for formalizing the customary practice of ownership of land by the female lineage in the family;
(ii) preparation of a proposal for institutional development of the forestry administration in Meghalaya, with a proposal for private sector involvement in forestry extension, as well;
(iii) species and distribution inventory for forest trees, bamboos and canes, and NTFPs in the North East to firm up knowledge of the resource and its locations for gaining adequate understanding of the conservation requirements and potential for exploitation; and
(iv) an assessment of the rural infrastructure, such as road network, and its renovation and development needs in view of improving the market links.

I. INTRODUCTION

A Reconnaissance Mission representing the International Fund for Agricultural Development (IFAD) visited the State of Meghalaya in the North Eastern Region in India from 14 to 27 November 2000 to undertake a review of the forestry and non-timber forest produce (NTFP) resource base, with particular emphasis on bamboo and rattan, and to assess how these resources could best be utilized to secure the livelihood of the rural poor while enhancing the overall growth of the area.

In Meghalaya the Mission had discussions both with public and private sector representatives. It visited some field sites, and met with a village organization (a natural resource management group) of the on-going IFAD-financed North Eastern Region Community Resource Management Project for Upland Areas. The Mission had further discussions with the Government of India (GOI) authorities, and representatives of the private sector in New Delhi from 28 November to 1 December 2000. A list of people met both in Meghalaya and Delhi is attached (Annex 1).

The Mission was requested by IFAD to assess the resource base, development potential, and major policy, institutional and capacity constraints for development of the forestry sector in Meghalaya, and to make recommendations for sectoral development and design for a potential investment project to be provided by IFAD. This report presents the Mission's findings.

II. FOREST RESOURCES

1. The Forest Resources of India and the North Eastern Region

1.1 India

Since 1987, the Forest Survey of India (FSI) has biennially assessed the forest cover of India by using remote sensing technology. State Forest Departments prepare detailed assessments in the states. These assessments form the basis of the 'Working Plans', which include information on species, growing stock, site characteristics and regeneration status.

According to the National Forest Policy of India (1988), one third of the geographical area of the country should be under tree cover for environmental stability. Presently, forests cover only 19 percent of the entire country. This percentage equals about 3.3 million square kilometers (km2). The per capita availability of forest is only 0.006 hectares (ha), while the corresponding figure in Asia as a whole is 0.1 ha.

Between 1997 and 1999 the assessment recorded an increase of the closed forest (above 40 percent crown cover) by 10,100 km2, a decrease of the open forest (10-40 percent crown cover) by 6,200 km2, a decrease of shrubland by 5,300 km2 and an increase of non-forest land by 1,400 km2. Despite the notable increase of dense forest, it is uncertain whether this is a sign of a long-term improvement of the forestland as a whole or whether the denuded forest areas will continue to grow.

1.2 The North Eastern Region

The forests of the North Eastern Region cover 26 percent of the total forest area of India, although the region constitutes only five percent of the entire country. The total forest cover

in the region is 163,800 km2, which is about 64 percent of the geographic area as against the national average of 19 percent.
Dense and open forests constitute 58 percent and 42 percent of the total cover, respectively. According to the 1999 assessment Arunachal Pradesh has a forest cover of 68,800 km2, or about 82 percent of the total land area, Assam 23,800 km2 (about 30 percent), Manipur 17,400 km2 (about 78 percent), Meghalaya 15,300 km2 (about 69 percent), Mizoram 18,300 km2 (about 89 percent), Nagaland 14,200 km2 (about 85 percent) and Tripura 5,700 km2 (about 53 percent). In the past five assessments made by FSI, a loss of 800 km2 was recorded between 1993-95. Since 1995 the forest cover in the region has gradually decreased, although Arunachal Pradesh and Tripura have shown a marginal increase.

The negative trend in the forest cover is partly due to the indiscriminate felling of trees for timber and partly due to the intensified shifting cultivation (jhuming). In 1987-97 the largest area under jhuming was in Nagaland (0.39 million ha), followed by Mizoram (0.38 million ha) and Manipur (0.36 million ha). These states together account for about 65 percent of the total area under jhum (1.73 million ha) in the seven states of the North Eastern Region.

1.3 Meghalaya

The total geographic area of Meghalaya is 2.24 million ha or 22,400 km2. Topographically, the entire State is a plateau except for narrow strips in the northern, western and southern parts. The elevation ranges between 150 meters (m) to 1950 m. The plateau forms a watershed between the Surma valley of Bangladesh and Bramaputra valley in the north. Many rivers, such as the Simsang, the Manda, the Ganol, the Umiam, the Umtrew and the Kupli, cut through the plateau. The most recent census (1991) recorded a population of 1.78 million, of which 85 percent belong to the Scheduled Tribes. The population growth rate was 2.8 percent, and density 79 persons per km2 according to the 1991 census.

The climate varies along with the elevation. The western part of the State is warmer with mean temperatures between 12 degrees Celsius (C) to 33 degrees C. The central upland is relatively cooler with a minimum temperature of 2 degrees C. The average annual rainfall varies from 4,000 millimeters (mm) to 11,400 mm. Cherrapunjee and Mawsynram are known to be the areas having the highest rainfall in the world.

The forest cover, based on satellite data of 1998, is 15,600 km2. Dense forest extends to 5,900 km2 and open forest to 9,700 km2. Forests cover close to 70 percent of the total land area. A comparison with the previous assessment reveals a net loss of 24 km2. The highest share of degraded forestland is found in the East Khasi Hills (29 percent), followed by the West Garo Hills (18 percent) and the West Khasi Hills (16 percent).

The various forest types of Meghalaya can be broadly grouped as follows:

- Sal forests – these are forest areas dominated by sal (*Shorea robusta*) with a mixture of other species, such as *Schima, Vitex, Careya, and Lagerstroemia.* The sal forests are divided into the alluvial sal, and foothill and plateau sal forests. The former is found on low alluvial belts, while the latter is found on the East and West Garo Hills.
- Mixed deciduous forests – these forests are found between sal dominated forests occupying mainly ridges and slopes.
- Evergreen forests – confined mainly to areas near streams and swamps.
- Bamboo forests – confined to areas, which have been subjected to extensive jhuming in the past. These forests occur in all districts, either as pure stands or mixed with sal and deciduous species.
- Temperate forests – occupy the higher elevations, mostly along the southern slopes of Khasi and Jaintia Hills, where the rainfall is high and the winter severe during November-March. Ground frost is common in these areas.

- Grasslands – this forest type is not found very extensively. In the East Khasi Hills grasslands occupy seven percent of the total land area. The Garo Hills and Ri-Bhoi has little grassland.
- Sacred Groves – fall under the temperate type. According to a study made by the Regional Center for Afforestation and Eco-Development under the North Eastern Hill University (NEHU) in 1994/95, only 79 sacred groves covering an area of 1,200 ha remain in the entire State. These forest pockets are richer in biodiversity than any other forest in the State.

According to the Forest Resources Survey of the State of Meghalaya (1990), about 82 percent of the accessible forests are classified as ”miscellaneous forest”, about 11 percent as ”Khasi Pine”, about four percent are under ”sal”, about two percent are ”hardwood mixed with conifers”, less than one percent is ”teak” and slightly more than half a percent is of the ”upland hardwoods”-type.

III. FOREST ADMINISTRATION AND MANAGEMENT

1. Forest Administration

The official forest administration in the North Eastern Region is being implemented at three different levels, i.e. by the Central Government, the State Government and the Autonomous District Councils (ADCs).

1.1 The Central Government

The main duties of the Central Government Forest Office in Shillong are as follows: (i) to regulate and facilitate functions related to the Conservation Act of 1980 and Environment Protection Act of 1986; (ii) to provide advice to the North Eastern Council (NEC) on forestry related issues; and (iii) to give advice on Central Government forestry investments.

The Regional Chief Conservator of Forests (CCF), who oversees two Wings (Forestry and Environment), represents the Central Government. The Forestry Wing has four staff and it caters for the requirements of the Forest Conservation Act of 1980. The Environment Wing has four scientists, who supervise the implementation of the Environment Protection Act of 1986.

The mandate of the Central Government Forest Office covers the entire North Eastern Region, including Sikkim.

1.2 The State Forest Department

The mandate of the State Forest Department is to protect and manage the Reserve Forests, the Protected Forests and the unclassified State forests, which comprise in total only about four percent of the entire forestland in Meghalaya. The Principal Chief Conservator of Forests heads the Forest Department. He is assisted by two Chief Conservators of Forests and five Conservators of Forests, each heading a Wing of the Department. In addition, the Department employs the following staff:

1	Planning Officer;
29	Deputy Conservators of Forests;
20	Conservators of Forests;
80	Forest Rangers;
14	Deputy Forest Rangers;
247	Foresters;
444	Forest Guards;
86	Malis (gardeners); and

11 Boatmen.

The Department employs nearly 1,000 persons on a permanent basis. About 500 casual laborers work for the Department.

1.3 The Autonomous District Councils

The three ethnic communities of Meghalaya: the Khasis, the Jaintias and the Garos occupy the seven districts of the Khasi Hills, the Jaintia Hills and the Garo Hills. In 1972 when Meghalaya became a separate State, three ADCs were formed to safeguard the traditional rights of the tribal communities, as prescribed by the provisions of the Sixth Schedule of the Constitution of India. Later the mandates of the ADCs have been expanded to cover the control and protection of the forestlands outside the State-owned forests.

The forests under the mandate of the ADCs also generate some, albeit minimal, revenue to the ADCs. Presently, the forest-generated revenue of the Khasi Hills ADC is IR 20 million out of a total budget of IR 150 million (1999-2000).

Constituent representatives elected for a five-year term comprise the Councils. The Governor of Meghalaya appoints the leader of the largest party as the Chief Executive Member. He heads the Executive Committee, which oversees the implementation of laws, rules and regulations pertaining to the respective districts. The ADCs have jurisdiction on lands other than State-forests, and regulation of jhum practices. They have their own District Council Forest Departments (DCFD), which issue permits for the harvest of forest products, transport permits and - in theory - approve forest management plans. Taxes on forest products exported outside Meghalaya are collected by the State Forest Department. A Chief Forest Officer, who is assisted by Divisional Forest Officers, Rangers and Forest Guards, heads the DCFD. The District Forest Officers managing the Reserve Forests within the boundaries of an ADC are under the control of the ADC.

The capacities and capabilities of the DCFDs to provide technical services to private forestry are negligible. The Departments lack technical expertise as well as funds to cater for the requirements of the forest owners.

2. Forest Management Practices in Meghalaya

The management of the forest resources in all states of the North Eastern Region is a complex task. The landownership patterns and the diversity of forest types are some of the factors, which make scientific forest management in Meghalaya difficult. Furthermore, the unclassed forests, which include privately-owned forests and forests under communal access, are not covered by the conventional Indian forest management practice, prescribed in the Working Plans.

Virtually all State-owned forests in Meghalaya belong to the closed canopy-type forests. State Forest Department keeps these forests under conservation and strict protection. No felling is allowed. Forests dominated by *Pinus Keysia* on the uplands are regularly burned to keep the undergrowth and pine litter from accumulating and hence protect the pine stands from too intensive forest fires. However, other fire prevention measures, such as arrangements for timely detection and clearing for fire lines are not practiced. The traditional customs prohibiting spread of fire from jhumland to nearby forests are not made use of, either.

The State Forest Department runs altogether 31 nurseries in Meghalaya. Their production targets were 1.2 million potted seedlings and 0.7 million bare-root seedlings in 1999-2000. The seedlings are used for enrichment planting activities in the State forests as well as for the Social Forestry Schemes on privately owned land. The Social Forestry Schemes are based on

the concept of the forest owner handing over her/his land to the Department for ten years for reforestation. During the contract period the Department has far reaching rights and obligations to restock and to protect the land. When harvesting the trees the forest owner pays a royalty, which is shared on an equal basis between the Governor of Meghalaya (the State) and the District Council. The cost of regenerating one hectare of forestland under a Social Forestry Scheme is estimated at IR 20,000.

According to the State Forest Department about 75,000 ha of forestland has been regenerated in Meghalaya through the Social Forestry Schemes during the past twenty years. After the Supreme Court ban on felling of timber in 1996, the Schemes were drastically reduced to a mere 75 ha in 1997-98, but increased to 1,200 ha in 1999-00. At the same time the budget of the Social Forestry Wing dropped from IR 29.5 million in 1998-99 to IR 17 million in 1999-00 resulting in a backlog of applications. The Mission was informed that presently the Social Forestry Wing is able use only one-fourth of its staff capacity due to the budget limitations.

The social forestry activities as practiced by the Department of Forestry in Meghalaya do not apply the true concept of social forestry. The Department controls the forest area during the contract period and there is little extension advice and interaction between the Department, the landowner and the community. Management of the State-owned forests through Joint Forest Management (JFM) in collaboration with the communities has not been practiced in Meghalaya, either. JFM, which is based on the concept of a partnership between the communities and the Forestry Department, is practiced in other States of India after being first introduced in West Bengal in 1972.

It appears that the State Forest Department gives too little emphasis on planting a wide variety of tree species, and exclusively plants pine trees under the Social Forestry Schemes. In some cases this may be justified since the areas may be heavily degraded, but not as a rule. No thinnings appear to be carried out in the pine stands, with the result that the growth of the pine trees is stunted 15-20 years after the planting.

Very few attempts have been made to introduce shrubland management. Many of the partly degraded forest areas could be regenerated without much effort and cost by implementing simple coppice management and protection. Similarly, little has been done to manage mixed hardwood forests in Meghalaya. Management of mixed hardwood forests is, however, a complicated subject, which still requires research.

While forest management plans (working plans) with management prescriptions have been used for the management of the Government reserve forests for a very long time, no management plans nor technical extension services for the private forests have been provided by the ADCs.

IV. FOREST INDUSTRY IN MEGHALAYA

Before 1996 cheap timber was being exported out of the North Eastern Region at an alarming rate. Table 1. illustrates the official exports of round logs and sawn timber from Meghalaya in 1991-92 (Forest Resource Survey Division, State Forest Department). The unprocessed logs were by far the most common item.

Table 1: Exports of Timber from Meghalaya in 1991-1992 (m3):

A. Logs

	Items	**Quantity**
	Round logs (Sal spps)	13,500
	Round logs & square beams (Non Sal spps)	720,200
	SUBTOTAL	**733,700**

B. Sawn timber

	Items	**Quantity**
	Sawn timber (Sal spps)	600
	Sawn timer (Non Sal spps)	1,200
	SUBTOTAL	**1,800**

C. Veneer

	Items	**Quantity**
	Core veneer	**32,900**
	TOTAL	**768,400**

In 1997 there were 166 sawmills, 75 veneer mills and one plywood mill in Meghalaya (The High Power Committee Report, 1997). The total number of sawmills in the North Eastern Region was 1,219. Furthermore, there were 260 veneer mills in the Region, 69 plywood mills, one match factory and four paper mills. One of the paper mills of the Hindustan Paper Corporation (HPC) in Nagaland has been closed down, much due to labor problems.

Two paper mills in Assam, owned by the Hindustan Paper Mills, buy bamboo grown in Meghalaya. One mill is located on Jagiroad, about 60 km from Gowahati. The other mill is in Packagram, about 50 km from Silchar. The mills use together about 800,000 metric tons of raw bamboo annually. About 40 percent of the bamboo raw material used by these two mills comes from Meghalaya. Bamboo from Meghalaya is also transported to paper mills in Southern India.

The current stoppage on felling of timber and the five-year moratorium on establishment of new forest industries has had a severe impact on the flourishing forest industry. Forest-based industries increased rapidly during the last decade (until 1996). These industries are primarily responsible for the increase of legal as well as illegal felling of timber in the whole North Eastern Region. Their raw material requirements exceed the carrying capacity of the forests. Consequently, there is an urgent need to strengthen the legal and procedural framework for licensing, operation and control of forest-based industries. In Meghalaya some measures have been taken to relocate sawmills to the ‘industrial areas’. No mechanism is, however, in place to coordinate the supply of raw material within the States of the North East, and to match the requirements of the wood-based industries with the sustained yield of the forests. This has contributed to the rapid depletion of the forests in the North East.

V. FOREST POLICY AND LEGAL FRAMEWORK

The *National Forest Policy of 1952* introduced a major change in forest policy by stating that agriculture no longer had a preferential claim on forestland. Furthermore, it refuted the notion that forestry *per se* had no right except to land, which is not required for any other purpose. The 1952 Policy also prescribed that one third of the country should be kept under forest cover. However, as a result of the changes in the society and the accelerated depletion of the forest resources due to increasing demand for fuelwood, fodder, timber etc., a new strategy for forest conservation had to be developed.

The current *National Forest Policy (NFP) of 1988* is more conservation oriented, stressing productivity as well as the needs and rights of the local communities, and their involvement in forest management activities. It also states: ”The life of tribals and others living within and near forests revolve around forests. The right and concessions enjoyed by them should be fully protected. Their domestic requirements of fuelwood, fodder, minor forest produce and construction timber should be the first charge of forest produce.”

The NFP of 1988 prioritizes environmental stability and ecological balance: ”The principal aim of the Forest Policy must be to ensure environmental stability and maintenance of ecological balance including atmospheric equilibrium, which are vital for sustenance of all life forms, human, animal and plants. The derivation of direct economic benefit must be subordinated to this principal aim.”

It states that the detrimental effects of shifting cultivation should be checked: ”Shifting cultivation is affecting the environment and productivity of land adversely. Alternative avenues of income, suitably harmonized with land use practices, should be devised to discourage shifting cultivation. Efforts should be made to contain the cultivation within areas already affected by propagating improved agricultural practices. Areas already damaged by such cultivation should be rehabilitated through social forestry and energy plantations.”

One of the main objectives of the NFP is to develop a people’s movement for protection of the forests. Forestry Action Plans were prepared in the various States for implementation of the policy. However, the results of the Action Plans are minimal.

The NFP of 1988 does not make any provision for the formulation of State-specific forest policies. The State of Assam had, however, prepared its own State Forest Policy just before the launching of the NFP. Preparation of a forest policy for the entire North East has also been considered.

The legal framework, which regulates the conservation, management and use of forestland in the North Eastern Region, consists of national and State legislation. The *Forest Conservation Act (FCA) of 1980* (including Amendments of 1988) was enacted with the aim to check further deforestation, which threatened to disturb the ecological balance in the country. Its provisions apply to all forests irrespective of the ownership or classification. All State-specific forestry related laws have to conform to the FCA.

The FCA states the following, which is of direct impact on the livelihoods and income generation of the rural communities:

- Forestland must not be converted into any non-forest use. Trees growing naturally on forestland must not be cleared for the purpose of reafforestation.
- Cultivation of tea, coffee, spices, rubber and palm is a non-forest activity.
- Cultivation of fruit-bearing trees, oil-bearing plants or medicinal plants requires prior approval of the Central Government, except when the species to be planted are indigenous to

the area, or such planting activity is part of an overall afforestation program for the forest area.
- Tusser cultivation in forest areas by the tribals as means of their livelihood without undertaking cultural Asan or Arjun plantations is treated as a forestry activity. No further Central Government approval is needed.

The Wildlife Protection Act, 1972 regulates the management of wildlife, most of which is found in the remaining forests. The supervision of the implementation of *The Environment Protection Act, 1986* is one of the tasks of the Central Government Forest Offices.

All the Acts issued by the Central Government supersede the legislation issued by the States. Following this, the State legislation has to conform to the Central Government legislation. However, a clear and concise interpretation of the vast array of local legislation versus the Central Government legislation is often extremely difficult.

For example, in Meghalaya there are numerous local laws and regulations, which are related to the forestry sector. Some of them are listed below:

- Management and Control of Forests Act, 1958/Rules, 1960;
- Meghalaya Forest Authority Act, 1991;
- Meghalaya Forest Regulation Act, 1973;
- Meghalaya Forest Rules, 1979;
- Meghalaya Forest Act, 1981 (Removal of Timber);
- Meghalaya Forest Rules, 1982 (Removal of Timber); and
- Garo Hills District (Forest) Act, 1958.

In order to stop the excessive felling of trees in the North Eastern Region in early 1990's, the Supreme Court of India issued an Order in 1996, which banned the felling of trees as well as the transport of timber from any of the North Eastern States to any other State in the country. The ban did not affect felling of trees on private plantations established on non-forest land. Furthermore, the running of sawmills of any kind, including veneer or plywood mills, was not allowed without prior approval by the Central Government. The Order also requested the States to provide information on the sustainable yield of the forests versus the capacity of the wood-based industry, and the quantum of logs lying in the yards of sawmills and other wood processing mills as well as in the forest.

In a further effort to preserve the dwindling forest resources GOI announced in early 1997 that duties on imports of logs, firewood and charcoal would be cut from 10 percent to zero. Duties on all other wood products remain high, between 32 to 56 percent. India has lifted most non-tariff barriers on wood products in recent years.

As a result of the clarifications prepared by the States for the Central Government the Supreme Court of India issued another order on January 15, 1998. The main stipulations of this Order are as follows:

- A moratorium on the issue of new licenses for the establishment of wood-based industry within the next five years, after which the Ministry of Environment and Forests will review the situation.
- Felling of trees will be permitted only against prepared management plans approved by the Ministry of Environment and Forests.
- Working schemes, including regeneration and harvesting plans, for the forests under the District, Regional and Village Councils must be prepared.
- Action plans for patrolling the forests should be prepared by the Chief Conservators of Forests and the Chief Forest Officers.

Many manufacturers of wood-based products in Southern and Western India relied heavily on log supplies from the North Eastern Region. As a result of the Order, some plywood manufacturers have been forced to close down their operations, while others have diversified their industrial activities. According to an unofficial estimate the Order has reduced wood and log shipments by over 90,000 m3 per month from the North East.

Presently, the forest authorities in Meghalaya are in the process of preparing working schemes for the approval of the Ministry of Environment and Forests. Because of the absence of concrete guidelines the situation in Meghalaya appears to be confused as to who should prepare the schemes and the related microplans, and who should supervise implementation.

VI. MAJOR ISSUES AND SUGGESTIONS FOR FORESTRY DEVELOPMENT

1. Issues

1.1. Policy and Legislation

The NFP of 1988 states that: ”Efforts should be made to curtain the cultivation within areas already affected by shifting cultivation by propagating improved agricultural practices”. This appears to be in conflict with one of the strongest provisions of the Forest Conservation Act, 1980; i.e no forestland must be diverted into non-forest land. Furthermore, the same Act prohibits the cultivation of, for example, tea and coffee on forestland. Whether the cultivation of small-scale tea and coffee gardens as part of an intercropping system would be against the Act is not clear. However, the conflict between the NFP and the Forest Conservation Act does not seem to be a major problem in practice.

The aftermath of the two Supreme Court Orders on timber harvesting is yet to unfold. There is strong pressure to continue tree harvesting, and the forest authorities of Meghalaya are in the process of preparing macro-level management plans. However, it is unclear, who will prepare the plans, particularly the microplans on individual forests for obtaining a felling permit, and who will advise, carry out and supervise regeneration. Regeneration should be an integral part of the management plan. Due to unclear demarcation of responsibilities for the preparation and supervision of the management plans and capacity constraints the forest authorities in Meghalaya will face difficulties in following up on timber harvesting, if this is to restart after approval of the macro-level management plans. In the worst case, unsustainable felling will continue.

1.2 Land Tenure

The land tenure in Meghalaya and the other Sates of the Region is extremely complex, and differs substantially from land tenure in other parts of India. Meghalaya has no comprehensive written land law, although the State Assembly and the District Councils have enacted some fragmentary legislation. Customary rights of the ethnic groups regulate the system. These again differ amongst the Khasis and the Garos. A distinctive feature of the land ownership system has been that the female family members are recognized as the authority for inheriting land, disposing of it and allotting the land to clan members for cultivation. Their role and rights differ amongst the Khasis and the Garos. However, the male family members, depending on their position in the family and clan, exercise paramount decision-making authority.

In the Khasi Hills there are two main categories of land: (i) community land, known as Ri-Raid, and (ii) clan land, known as Ri-Kyanti, of which much has passed to private ownership by now, with heritable and transferable rights to the land. Ri-Raid lands belong to the whole community, which has authority over the management of these lands. Every member of the

community has the right of use and occupancy without inheritable or transferable rights. However, by making permanent improvements to the land, and by raising permanent crops, such as trees, the occupant acquires permanent, heritable and transferable rights on the land, with the condition that the land is not left fallow for three years. Some minor areas on the Khasi Hills acquired by the British have been allotted under 'pattas' (registration certificates) to the occupants.

On the Garo Hills almost all land is A 'Khing' or clan land. A'Khing' land was surveyed and boundaries demarcated and registered by the British, and a register is maintained to date. This clan land is allotted for individual clan members for cultivation. However, if land under jhum is converted into perennial crops or terrace cultivation, clan land can be transferred to private ownership, and a 'patta' issued by the District Council.

The above illustrates the complexity of the land ownership system. The traditional clan controlled-system, which secured subsistence cultivation rights and access to forest produce, is presently rapidly eroding. The more influential and well-informed members of the clans and even non-tribal people (also the State is considered 'non-tribal'), who in theory should not be allowed to purchase or occupy land belonging to the tribes, are accessing land under formal land titles from the clans. At the same time, it appears that the control exercised by women, and thereby their security, is diminishing. There is, however, very little documentation on the changes taking place in the patterns on land ownership and user rights in Meghalaya, or any other states in the North East. The uncertainty of long-term access to land, or the ownership status, is one of the major limiting factors when an individual farmer or a community makes decisions on land use and on long-term investments, such as those required in forestry.

1.3 Shifting Cultivation

Shifting cultivation has been practiced on the uplands for centuries. Jhuming involves clear felling of the vegetation on hill slopes, burning the biomass, sowing the agricultural crop seeds throughout the area burned, weeding and protection of the emerging crops and harvesting. The process is repeated for one or two more seasons, after which the cultivators move to other forest areas, where jhuming is repeated. Once the entire forest area available for jhuming has been used, the circle is closed. Due to a rapid increase of the population, the jhuming cycle has come down to a mere three to five years.

Mixed cropping patterns are usually adopted in the jhum areas. The crops raised include paddy, maize, millets, cotton, ginger, turmeric, sweet potato and mustard. Near Shillong also various types of vegetables are grown. Under the present practices, jhuming is a destructive form of land use, in which the poor yields are not commensurate with the inputs.

According to the FSI State of the Forest Report 1999, jhuming on privately owned forest land decreased the forest cover in the State of Meghalaya by 75,000 km2 in 1995-97. An additional 2,000 km2 was lost due to other reasons. Having a natural regeneration of 20,000 km2, the net loss was 57,000 km2. The remaining stock is steadily degenerating, biodiversity is being lost and valuable NTFP-resources are being depleted.

Out of the total geographical area of 25.5 million ha in the North Eastern Region an area of about three million ha is under settled agriculture and about 2.7 million ha are under jhum practised by 450,000 families (GOI Expert Committee, 1997). It is also estimated that at any given time one-sixth of the total jhum area is under current jhum.

1.4 Forest Administration

The mandate for managing and controlling the privately owned forests in Meghalaya lies with the ADCs. Because of their budget constraints and shortage of technically competent staff, the ADCs cannot perform this function, and very little forest extension is provided to the private forest owners and village communities. Presently, the private sector, such as nongovernmental organizations (NGOs) in Meghalaya do not have the expertise, either, and have not embarked upon any other activities except little awareness raising on natural resource management issues. Apart from the on-going IFAD-financed project, there are no other opportunities for private forest owners or communities to access advice on sustainable forest management practices in Meghalaya.

2. Suggestions

2.1 Forest Policy and Legislation

The forest policy and legislation applying to the States, such as Meghalaya, would need to be reviewed and simplified to remove any constraints to sustainable multipurpose forestry on privately owned lands and on lands under communal access.

2.2 Land Tenure

Under the existing land ownership system, based on customary rights, it appears that the best approach is communal dialoque through village organizations, such as the natural resource management groups, to reach a consensus on land use and land tenure. This consensus-building can be used to formalize the user rights under lease-arrangements or even to transfer the ownership to the more vulnerable households in the community. The traditional ownership arrangements through the female lineage of the families should be formalized through documented registration to maintain women's access to land, which appears to be eroding under the present trend of ownership registration. A detailed review of the land ownership situation and registration process should, however, be carried out to document the situation for further formalization.

2.3 Shifting Cultivation

Introduction of sustainable multipurpose forestry, including the production of timber, fuelwood, poles, bamboo, cane, fodder, fruits, honey, broom grass, mushrooms, food crops, etc. can provide the farmers with cash income and produce for their household needs, and thereby will reduce dependence on jhuming.

2.4 Forest Administration

The attitudes and technical capabilities of the ADC forestry staff on sustainable multipurpose forestry can be improved through intensive institutional development and capacity building. The private sector advisory services can be simultaneously developed to supplement scarce public sector services.

VII. DEVELOPMENT POTENTIAL OF FORESTRY IN MEGHALAYA

1. General

Much of the forestland in Meghalaya, which has not yet been reduced to grassland or is not heavily degraded, has the potential to grow a wide variety of valuable tree species such as

Shorea, Tectona, Quercus, Castanopsis, Schima, Artocarpus, Albizzia, Terminalia and *Pinus*. In addition the forestland produces a wide range of NTFPs, which are of great importance to the rural population.

These species and a number of others form the growing stock of 53 million m3 in the open forest areas, which are in the process of being depleted. If these open forest areas with a crown cover of 10-40 percent were to be upgraded to the dense forest category through sustainable forest management, 95 million m³ could be added to the standing stock (Project on Carbon Sequestration, 1999/State of Meghalaya). Theoretically, if the major species were sal, and 47.5 million m3 were converted into sawn timber in Meghalaya, the income to be earned would be IR 950 billion (at an average price of IR 20,000 per m3 in New Delhi, according to 'Market Prices of Forest Products', August 2000/F.R.I., Dera Dun). This equals USD 20 billion.

From a strategic point of view, efforts to salvage the privately owned and communally managed forests from further degradation and ultimate destruction should be concentrated on forestland, which still has the potential to recover through natural regeneration and enrichment planting. First, the productivity of these forest areas should be restored to address the various needs of the rural population. As a result, also the biodiversity would improve.

2. Wood Processing Activities

Before the Supreme Court Order on tree felling most of the timber produced in the State of Meghalaya was exported, either legally or illegally. Practically all timber could, however, be processed in the State in order to add value to timber before export.

2.1 Village-level Wood Processing

The options for village-level wood processing in Meghalaya are very few. The most basic wood processing is often limited to cutting the logs into rough planks by *pitsawing*. The logs are sawn at the felling site and the planks are manually carried to the roadside, from where the planks are collected by dealers.

The potential of *small-scale manufacture of wooden furniture* in the villages is limited due to lack of proper infrastructure, such as electricity and roads. Due to these constraints, manufacture of wooden furniture usually takes place in urban areas. However, production of cane furniture is more feasible at village level.

Employment and income earning opportunities could be created at the village level by establishing *timber harvesting teams*. For example, a Self Help Group interested in timber harvesting could be trained in proper harvesting techniques. The tools required could be purchased using microcredit arrangements.

The villagers could, however, earn better income from timber and wood products, if efforts were directed towards production of raw material of better quality, and this was better marketed.

2.2 Wood Processing in Urban Centers

Various forms of wood processing are more feasible in urban areas, where adequate infrastructure, skilled labor and markets are available. *Sawmilling* is already widely practiced in Meghalaya. However, due to the Supreme Court Order of 1998 on felling of timber much of the sawmilling capacity in Meghalaya may have been lost, at least temporarily. Despite the current problems, sawmilling may be the most appropriate form of wood processing in

Meghalaya – as long as the sawmill owners adhere to the regulations on obtaining raw material.

There appears to be also an expanding market for processing locally sawn planks and boards into *furniture, doors, door and window-frames and even laminated wooden beams* for local use as well as for export to mainland India as well as to Bangladesh.

There are about 1.7 million *handlooms* in the North Eastern Region, of which looms in active use are about one million. About 0.16 million looms are being commercially used (District Industries Center, Shillong). In Meghalaya there are about 4,300 commercial looms and 30,000 non-commercial looms. Looms are made by private manufacturers or Government-owned units. The production capacity of the existing units is not adequate to provide for the demand for wooden (sal) looms, although there is competition from looms made from steel. According to an estimate made by the District Industries Center (DIC) the total capital requirement, including fixed capital and working capital, for a unit producing 600 looms in a year is around IR 250,000.

However, as long as the restrictions based on the Supreme Court Order are in force further development of wood processing industry in Meghalaya is very difficult.

2.3 A Pulp and Paper Mill in Meghalaya?

The paper industry in India has steadily increased its capacity from 0.14 million tons in 1951 to 2.16 million tons in 1983. In 1983 there were a total of 179 paper mills, the capacity of which ranges from 5 to 250 tons per day. The latest newsprint mills have a capacity of 300 tons per day (Association for Indian Paper Makers).

Most small paper mills established in the past use agricultural residues, such as rice and wheat straw, cotton rags, hemp, jute and grass as their raw material. The production of the larger paper mills is based mainly on bamboo and hardwood fibers.

In many parts of India supply of bamboo to the paper mills has been shrinking. About 30 large integrated mills, with a capacity of 1.4 million tons, use on an average from 60 to 65 percent bamboo and from 30 to 35 percent hardwood as their raw material. The entire paper industry uses approximately two percent of the country's total wood consumption and 51 percent of the bamboo. Due to the growing shortage of wood as well as bamboo, the paper industry expects a raw material shortfall of 4.94 million tons of air-dry raw material this year (Council for Paper, Pulp and Allied Industries). As a result, the West Coast Paper Mills in Dandeli, in Southern India, procures some of its bamboo raw material all the way from Meghalaya.

There are two pulp and paper mills in Assam close to the Meghalayan borders. They are located in Nowgong and Cachar and run by HPC. Each mill has a capacity of 100,000 tons per year and uses 220,000 metric tons of dry bamboo, which is equal to 400,000 metric tons of raw bamboo. About 40 percent of the bamboo comes from Meghalaya.

HPC has a paper mill also in Nagaland. The company was, however, forced to close down this mill, mainly because of shortage of electricity. The company also faces problems with its mills in Assam, due to labor problems and erratic supply of raw material, especially during the rainy season due to harvesting and transport problems. The company has no plans to invest into another pulp and paper mill in the region within the foreseeable future.

The establishment of a paper mill is normally a considerable investment, which requires operations of a large scale. A large paper mill is a sophisticated process-industry, which requires the following:

- a reliable and steady supply of raw material;
- an efficient system for transport of raw material, either by road, rail or waterways;
- a good supply of water;
- a reliable supply of various bulk chemicals;
- a reliable supply of electricity;
- a skilled and reliable labor force; and
- easy access to the markets, including efficient transport of the final bulk products to the markets.

Meghalaya would have difficulties in fulfilling several of these prerequisites. This is probably one of the reasons why no Indian paper manufacturer has invested in Meghalaya so far.

The establishment of a paper mill would also pose a severe threat to the fragile river system in the State. A conventional paper mill pollutes lakes and streams heavily, due to effluents from the production process, including zero-fibers, chlorine from the bleaching process and other chemicals from the cooking process. Therefore, environmental risks are substantial.

Based on the above, the Mission is of the opinion that presently it does not appear feasible to consider establishment of a pulp and paper mill in Meghalaya.

VIII. NON-TIMBER FOREST PRODUCTS (NTFP)

1. Production and Market Potential

Until now the rural populations in the North Eastern Region have to a large extent relied on the forest resources for meeting their day-to-day requirements for fodder, shelter, medicine and food. Furthermore, a large proportion of the revenue collected by most State Forest Departments comes from the trade of NTFPs. The local people are involved in collection, processing and marketing of a wide variety of NTFPs, such as bamboo, rattan, honey, mushrooms, broom grass, fruits, nuts, bidi leaves, sal and teak leaves, resins and medicinal plants. Despite their importance to the local people as well as to the State Government the management of the NTFPs has always been neglected in favor of timber.

NTFPs often are of heterogenous quality and have been of the greatest value on the relatively restricted local markets. The NTFPs are, however, gaining increasing importance, because of the recognition of their several comparative advantages, such as their high value per volume/weight. Often the income derived from NTFPs may even exceed that of wood. The concern about conservation of biodiversity has contributed to the increasing recognition of NTFPs.

NTFPs can be divided into two major groups: (i) traditional NTFPs collected from the forests, and (ii) cultivated NTFPs.

The output of *traditional NTFPs* tends to be sporadic or seasonal. They are harvested manually and processed primarily at home. Traditional products are either consumed by the collector or sold to the local market. Only the most valuable traditional NTFPs are exported from the State through middlemen. Many traditional NTFPs can, however, be developed into marketable products, and the income earned from them can be increased by value-addition at village level.

Typically, if a particular NTFP develops a heavy demand on the Indian or international market, it can soon become depleted or even extinct. This has happened in the case of *Cinnamomum zylenicum* grown in Ri-Bhoi, and in the case of *Litsea marsinrum* and *Litsea*

salicifolia grown in South Garo Hills in Meghalaya (B.K. Tiwari). Also in the case of agar oil, which is extracted from the heartwood of *Aquilaria agalocha,* destilled in Manipur and exported mainly to the Middle East, excessive exploitation has taken place. GOI has now banned export of this precious tree. The State Government of Meghalaya has banned export of tree bark.

Many *cultivated NTFPs* are commercially viable, and are exported to mainland India and abroad. These products are sold either as primary commodities or refined into semi-finished or finished products before export. Large Indian companies, such as Hindustan Levers, Dabur and Himalayan Drugs, export NTFPs. While for example *Citronella* grass is cultivated in Meghalaya and Assam, the major commercial cultivation of medicinal and aromatic plants for export takes place in Uttar Pradesh, Tamil Nadu, Karnataka, West Bengal and Madhya Pradesh.

Many NTFPs are sold on the local markets either by the collector him/herself or shopkeepers. Items made of bamboo and rattan, areca nuts, *Potentilla* and other herbs, honey, broom grass, ginger and different fruits are brought to the township markets by the villagers, who often spend many ours traveling to reach the market place. Little information is, however, available on the quantities of NTFPs, which are locally sold.

While consumption by the village households themselves as well as by local markets will continue to be important as outlets for the traditional NTFPs collected from the forests, organized cultivation for the expanding markets should be developed, particularly for medicinal and aromatic plants. Over 30 percent of the medicinal plant species in India are already classified as critically endangered. GOI has banned the exports of 59 medicinal plants and more species will soon be covered by the ban due to their endangered status (Dabur Company Spokesman).

With the growing national as well as international preference towards natural products, the markets for many NTFPs are expected to grow rapidly. India is the home of Ayurvedics, the science of health, which has existed for over 5,000 years. About 1,000 different plant species are used in Ayurveda. About 9,500 species collected from the forests are used by tribal communities (IDMA Bulletin/1996). Since 1992 the Indian exports of medicinal plants have been increasing at an annual rate of 26 percent reaching USD 260 million in 1991 (COMFORPTS, Dehra Dun). However, despite its long history in ayurvedic preparations the share of Indian exports of the international markets for natural health products was only 0.6 percent in 1997, as compared to 3.6 percent for exports from China (APEDA).

The world trade of most NTFPs varies significantly from year to year. The major reasons are: (i) the crop of NTFPs fluctuates; (ii) the harvest and demand for the crop are seasonal; (iii) transport, storage and processing problems; and (iv) marketing channels are poorly developed.

Data on world trade of NTFPs is scarce, since many NTFPs are traded unregistered, and many NTFPs do not fit any specific commodity group. In 1995 the total value of registered world trade in NTFPs was around USD 11 billion. The three leading importers of NTFPs were the European Union, USA and Japan. They accounted for 60 percent of the world trade in NTFPs.

2. Development Potential and Processing of NTFPs

Cultivation of NTFPs should be seen as an integral part of sustainable forestland management. The cash income derived from the sale of NTFPs could offer significant supplementary income to the cash-poor rural households. The income derived by the collectors/cultivators can be increased by processing at village level, and by improved

marketing. Some of the most promising NTFPs include broom grass, mushrooms, and aromatic and medicinal plants and trees, including turmeric, ginger and citronella. These are described in Annex 2.

Presently, at household level the processing of NTFPs is limited to washing, cleaning and drying. More emphasis should, however, be placed on improving production of NTFPs of good quality. The raw material could then be further processed at village level, in processing centers owned and operated by village entrepreneurs, for example Self-Help Groups.

At village level simple processing facilities for products such as honey, broom grass, medicinal plants, mushrooms, bamboo and cane could be established. These processing facilities can include facilities for further cleaning and washing, drying in open sheds, extraction of honey and sorting of the products. A centralized weighing system for establishing the correct weight and volume of the products is also required. The village-level processing facilities ensure higher and more uniform product quality, can improve hygiene and cleanliness of the process, and enhance marketing.

3. Issues in NTFP Development

The major issues in developing the potential of NTFPs as a lucrative source of cash income for the rural populations include the following:

(i) With deforestation the habitat of many NTFPs is decreasing. Cane does not grow without supporting trees, and many other NTFPs, such as mushrooms and even honey, depend on forests.
(ii) Some of the wild NTFPs can easily become overexploited.
(iii) The growers are not familiar with proper cultivation techniques.
(iv) All too often the collectors/growers get only a fraction of the final price of the product due to the involvement of too many middlemen in bringing the product from the forest to the consumer.
(v) Villagers often produce very small quantities of NTFPs, which reduces the interest of the buyers to collect products as well as the villager's interest to travel to the nearest market.
(vi) Due to storage and transport problems particularly perishable NTFPs, such as fresh mushrooms and certain fruits, face marketing problems.
(vii) Little reliable information exists on the production and trading of NTFPs.

4. Suggestions for NTFP Development

The lucrativeness of NTFPs as a source of cash income to the rural poor could be enhanced by the following:

(i) Collection, processing and marketing of NTFPs properly organized (e.g., through Self-Help Groups) would leave the producers with a greater share of the value addition, and thus make investment in NTFPs more lucrative to the rural households.
(ii) The producers' access to seeds and seedlings of good genetic quality should be improved.
(iii) The producers need assistance in establishing market connections with a minimum of middlemen.
(iv) Medicinal and aromatic plants for export could be grown under contracts with domestic firms to eliminate too many middlemen.
(v) A simple market price information system easily accessible by the rural communities should be established.

(vi) Microcredit facilities should be accessible to the rural households/communities for investing into simple processing equipment and facilities.

IX. BAMBOOS AND CANES

1. Resource base

1.1 Bamboos

Bamboos are well adapted and highly productive in this region of India. Rainfall is sufficient for rapid and reliable growth. Soils are intrinsically good at holding water. Altitudes below 1,400m have temperatures appropriate for reliable growth of high quality, productive large-diameter bamboo species.

The topography of Meghalaya is such that only small pockets of land are suitable for agricultural crops, the rest being too steep and prone to surface soil erosion. The root systems of bamboos comprise soil buttressing rhizomes and dense surface root systems. This makes them very effective in soil and soil fertility conservation. In such upland areas the most productive forms of land-use often make use of intricate crop mixtures planted according to details of micro-topography. Bamboo clumps are easy to incorporate and manage in this context of farm forestry as well as in larger scale natural stands and plantations. In addition rapid nutrient recycling in bamboos makes them an effective component of a mixed fallow crop for areas that remain under shifting cultivation.

With their natural coppicing habit and rapid growth of delicate shoots, bamboos are very well suited to sustainable management. The concepts of management for sustained yield and a mixture of products are already understood in local communities with regard to bamboos. Local planting techniques are also adapted to reduce losses from browsing damage, although current levels of freely grazing livestock are currently encouragingly low in this area.

North East India is home to around half of India's bamboo species, giant woody grasses that thrive in warm, moist mountainous terrain. A special characteristic of the region is the wide occurrence of spreading, rather than clump-forming bamboos not seen elsewhere in India. *Melocanna baccifera* is seen at lower altitudes, while *Phyllostachys mannii* is common on the Shillong plateau. Meghalaya has a rich bamboo flora although the precise number of species is not yet known. A total of 20-30 bamboo species may be present. These currently provide for basic rural housing needs, as well as supporting the pulp mills of the region. A list of those species expected to occur in Meghalaya and the characteristics of the species actually seen are given in the bamboo inventory, attached as Annex 3.

Moist and sloping sites below 1,500m throughout Meghalaya support large bamboo populations of varying density, estimated to constitute a total area of some 3,100 km2 (all inventory figures 1990), mostly found on privately owned forestland, of which bamboos are estimated to constitute in the order of half the total area. Three species are particularly widespread. *Dendrocalamus hamiltonii* is by far the most common bamboo, the tall pendulous thin-walled culms being a distinctive characteristic of the lower river valleys leaving the state on all sides. It has been estimated that this species covers at least 1,500 km2 in Meghalaya, and it is widely exploited for its edible shoots and thin-walled culms. A shorter, spreading bamboo, *Melocanna baccifera* forms large, continuous stands further up the valley slopes. The incidence of this species increases substantially from east to west, with an estimated extent of 500 km2. *Bambusa* species, predominantly *B. nutans* subsp *cupulata*, are the next most common bamboos. These thick-walled species are mainly used for constructional purposes. They are usually planted on private land to supplement the natural populations of thin-walled bamboos, giving a more dispersed coverage of around 500 km2.

Estimates of present stocking have varied substantially. However, it would appear that the three most common species probably constitute a standing crop in the order of 500 million sound culms. The present stock has been estimated as having a total dry weight of 2.6 million tonnes. Informal unsubstantiated guestimates of current export from the state are in the region of 50,000 tonnes. Most of the export is unrecorded, and a substantial proportion is probably moving through the theoretically closed border into Bangladesh.

Other, medium stature bamboo species are found in more restricted localities with higher rainfall. Several of these, such as *Cephalostachyum capitatum* and *Pseudostachyum polymorphum* are very high quality bamboos with particular local uses. Some have rare or threatened conservation status, and are indicators of highly biodiverse areas.

Above 1,500m larger bamboos become scarcer. Forested areas and streamsides in degraded areas of the Shillong plateau have scattered clumps of small *Drepanostachyum* species, including *D. khasianum* above Shillong itself, while the spreading *Phyllostachys* species identified as *P. mannii* has been planted around cultivated land and homesteads on a substantial scale. These species are roughly interwoven and daubed with mud for house walling. *Phyllostachys* species also provides a valuable windbreak on the Shillong plateau and provides quite durable fencing material.

Other states of North East India contain similar bamboos, but in different proportions. It is understood that closer to the Burmese border, in Mizoram, Manipur and Tripura, *Melocanna baccifera* is even more prevalent, accounting for up to 80 percent of the standing crop. As the Meghalayan name for *Phyllostachys mannii* is Naga Bamboo, that species is probably more common in Nagaland.

1.2 Canes

Climbing thorny palms known as rattans or canes are certainly also abundant in a few areas below 1,000m, although their identities, distributions and extent have never been studied. The largest species, with the highest economic importance in the Northeast is *Calamus latifolius*. It forms the basis of the cane furniture industries in many areas, but it may have already been reduced substantially or eliminated in Meghalaya by over-exploitation. Up to 10 lower value species of smaller size may also be present. South Garo Hills is reported to be the district with the most cane. In Arunachal Pradesh, another large species, *Plectocomia himalayana* may also be of importance. Canes are currently almost exclusively natural in North East India, with cultivation a rare exception, because of complete or lack of experience or knowledge of propagation techniques, and inherent difficulties in managing and handling such spiny plants.

2. Development Potential

2.1 Supply of Bamboos and Canes

With a pre-existing and extensive bamboo resource base on which to draw there should be little immediate need for large-scale propagation of bamboos, although in the longer term it may be necessary to improve stocking levels, to vary the species mix to suit developing utilisation requirements, and to re-establish stands after flowering events. This is fortunate, as there is apparently little present expertise or infrastructure available in either public, private or civil society sectors within Meghalaya to implement any such activities for indigenous bamboo species.

Although a program of planting bamboos on jhum land has been suggested in the past, there are certain problems with this. Firstly bamboos are present in such large quantities that planting more might not serve to produce the balanced diversification of crops considered

appropriate given the variability in upland sites and markets. Secondly bamboos become abundant in much of the fallow jhumed areas without assistance anyway. Thirdly any establishment enterprise would have to compete with large existing supplies available more cheaply as they have no establishment costs.

The species in Meghalaya and the North East are eminently suitable for highly productive sustained management. The species indigenous to the region are easy to manage, with relatively open, uncongested clumps and no thorny branches. The technical aspects of bamboo management are fairly well understood throughout Asia, and Meghalaya would appear to be no exception. Removal of a fixed proportion of older culms each year or on a two or three-year cycle maintains productivity, vigour and culm size. If access routes have to be made or repaired prior to extraction then removal of a larger proportion of culms on a longer rotation might be more economical. A balance is required between productivity, consistent large culm size, and cost of extraction, according to the requirements of the particular end-use. If edible shoots are being produced, then timing and the intensity of shoot removal have implications on productivity and other uses.

The present bamboo-bearing areas could apparently be much more intensively managed. The bamboos seen were only lightly exploited and not managed for maximum productivity. However the small number of areas visited was not sufficient for firm conclusions to be drawn. The total area currently holding bamboos and the high potential productivity of these species on these high quality sites would indicate a potential annual yield of around 2.5 million green tons without further plantings. Yields to be expected from the three most common species when properly managed in the North East would be in the region of 30-40 green tons per ha per year. Most of the bamboo forest elsewhere in India consists of tougher, low productivity species growing under adverse conditions of climate and heavy grazing pressure. Yields from *Dendrocalamus strictus* and *Bambusa bambos* in such forests may be as low as two-five tons per ha per year, although extraction costs would be lower on the relatively flatter sites on which they grow.

As a raw material for pulping alone this potential productivity should have a value in the order of IR 500 million per annum at the roadside. Scope for value addition is huge. As split bamboo ready for weaving and taken to the market the value apparently rises tenfold to IR 5 billion pa @ IR 5 per dry kg. Further value addition is possible according to skill levels and the amount of investment in cottage or small-scale industrial development that can be achieved. Supply of more refined products involves more complex issues specific to each potential product.

It is clear that the biological and ecological potential to develop supply of bamboo for raw material and value-added products from within Meghalaya and the North Eastern Region is immense. Other complicated socio-economic and institutional factors are currently holding back the sustainable management and utilisation of this resource.

Sustaining supply of rattans is intrinsically much more difficult than sustaining supply of bamboos. Rattans are usually extracted along with the trees on which they find support, and they often represent a mere by-product of tree-felling operations. Management of these high-climbing, viciously spiny plants for sustained yield is rather difficult. Extraction of a single shoot of clumping species from tree branches is not easy. Some species produce just a single solitary shoot anyway, and are killed outright by harvesting. Unlike bamboos, which resprout well between jhum cycles, rattans do not have time to establish themselves and attain maximum size even in traditional long rotation jhuming, so that utilisable sizes may only be found in undisturbed forest areas or those being well managed on a long rotation, which are currently dwindling in size.

Cultivation of rattans is nevertheless a possibility, and is practised in Southeast Asia and in South India. As the value of raw cane of good dimensions is relatively quite high, and a major cost in the production of furniture, the costs of raising and managing rattan plantations could be recouped. The best hope for managing rattan production is for it to be incorporated with the planting of long rotation timber crops. However, there is apparently little or no tradition of raising rattan plants in the North Eastern Region, and the amount of information available on identification, distribution and silviculture of species in the North East is extremely limited. Propagation is not a simple undertaking and seed cannot be stored. Collection of wild seedlings from the forest for cultivation elsewhere is not compatible with conservation.

Incorporation of just bamboo and rattans together in plantations is probably not feasible. Rattans require a long-term tree structure for support. Bamboos cannot provide that support, and regular extraction of bamboo culms becomes very difficult if rattans are abundant.

2.2 Demand for Bamboo and Cane

Demand for basic bamboo pulping material in India is likely to increase greatly, subject to the future economics of the national and international pulp and paper industries. Information on this could not be obtained in Meghalaya or Delhi and further investigations are required. The pulp mills ought to provide a good market for areas with reasonable access. At an even more basic level bamboo is sometimes considered as a biomass crop for generation of electricity in some countries, with potentially unlimited demand.

Demand for bamboo poles for weaving into house walls in Bangladesh is very high indeed. Where road or river transport to the south is possible whole culms can easily be exported. Opinions differ as to the size of this market, but the price offered for unprocessed culms is low and consideration should be given to adding value by weaving prior to export.

A wide range of added value bamboo products have been suggested from previous in-depth product and market studies. A detailed and comprehensive two-volume report of present and potential bamboo based products was prepared by North East Industrial and Technical Consultancy Organisation Ltd (NEITC) for the North East Council in 1998.

In more interior areas from where transport costs of bulky raw materials are prohibitive, several of these may be especially appropriate. The most basic conversion is the flattening of culms, followed by interweaving these into rough mats as a finished product for building construction. These steps require little skill and are immediately achievable. Weaving into more advanced mats after splitting and production of slivers requires more skill and time, but results in higher added value.

Simply woven mats, basketry and utensils for rural uses seem to bring in very low incomes and have a limited market, which is probably already saturated, as these can be made almost anywhere. One of several studies commissioned by UNDP this year prior to support interventions by UNIDO in utilisation of bamboos and canes in the North East found that some traditional handicraft products brought in startlingly abysmal returns for craftsmen, with incomes well below the government minimum wage for unskilled labour.

Production of higher quality woven utensils and ornaments for the tourist market is possible, but on a limited scale, subject to good design and marketing. Export of woven basketry outside India is not recommended, as the international market has abundant supplies of high quality low cost products from industrial scale operations elsewhere in Asia. Transport costs for such bulky lightweight low value items are an added problem.

Production of high quality mats as a precursor of further conversion into bonded and laminated board products elsewhere in the State has very high potential indeed, but requires

considerable co-ordination of supply and demand. The market for durable construction materials made from bamboo is very large. Aesthetically pleasing bamboo matboards can compete with timber-based plywood, and have the advantage of a green aura, coming from an environmentally sound, sustainably managed natural resource.

Preservation of edible bamboo shoots of certain species is a largely unexplored area with possibly the greatest potential for lucrative national and international marketing. Shoots are currently purchased for canning by Chinese entrepreneurs in Calcutta. Local canning facilities are already available and can be established quickly.

Demand for cane furniture is high domestically and internationally. Present skill levels are high in the region, and institutional training capacity could allow immediate expansion of small-scale furniture production units, subject to supply of raw material. NEITC, in Profiles of Tiny Sector Projects for the North Eastern Region (1999) estimated that there was sufficient demand for the cane furniture industry to expand at 20 percent per annum, with an additional 40-50 units in the North East each year.

3. Issues relating to Development of Bamboo and Cane

Clearly the potential demand for bamboo and cane products is sufficient for considerable expansion of the sector. Neither potential supply nor potential demand are constraints to the development of the bamboo resource, but increasing supply of rattans does seem to involve intrinsic difficulties in that sector.

If there is a lack of sound sustainable management and a low utilisation rate of bamboos at the present time, it suggests that there are currently serious constraints that have to be considered and addressed in the light of broader issues, relating to land use, forestry policy and administration, land ownership, human resource development and incentive policies.

Considerations such as whether India, or whether particular individual states should be exporting bamboos to neighbouring countries are policy issues to be addressed by the Central Government.

3.1 Land Use

The Northeast Region including Meghalaya shows considerable variation in land and land-use patterns, dictated by climatic, soil and slope, socio-economic and land tenure factors. The best climate, soil and slope conditions support permanent agriculture, intermediate areas are often managed under shifting cultivation, and the poorest areas, either too steep or too dry or with soil problems have either stayed under forest cover, or have been reduced to environmentally degraded areas.

One of the main issues in the North East would appear to be the widespread use of jhum cultivation, and it has been suggested that bamboo cultivation might be a better alternative land-use. It would seem that at the present time extensive planted monocultures of bamboo are not appropriate in terms of maximising productivity and income from the highly variable sites presently under jhum. A gradual transition from jhum to more sustainable and more permanent land use probably involves a gradual refinement of an intricate mosaic of crops. This would include bamboos within a broad package of timber, wood, non-wood and cash crops, aimed at reducing areas of arable cultivation and soil disturbance on slopes, while providing rural income generation to supplement cultivated food supplies.

Assessing which areas are appropriate for bamboos and would be better suited to other land-uses or crops on a micro-scale involves a multitude of technical decisions often best left to the stakeholders themselves. These decisions can only be considered properly on a case-by-case

basis at the grassroots level. It is felt that optimising food security and income generation for the benefit of those living on the land will require an intricate mosaic of cropping patterns into which bamboo or cane would be adopted or incorporated on a micro-scale rather than as a broad-scale prescription. This requires control over land and its use by the stakeholders, and a detailed renewable resource management plan for each area, developed at length by the stakeholders themselves, but with some external motivation and assistance. The technical feasibility of this approach is not in question. Models of transition from shifting to permanent cultivation can be followed, and lessons learnt from successful models such as the International Development Research Center (IDRC)-sponsored model in Nagaland can be applied.

Nevertheless, bamboos seem particularly appropriate as a permanent crop on steeper slopes where surface soil erosion or minor landslides are a threat to adjacent land or infrastructure, particularly along watercourses and roads. They are also particularly appropriate on boundaries, at the margins of cultivated land and as windbreaks in some areas. On shallow soils and stony sites they are less appropriate unless moisture is not a limiting factor. If not too dense they are suitable as a fallow crop in areas of sustainable shifting cultivation as they re-establish quickly and recycle nutrients rapidly.

On areas of degraded land bamboos would only be successful if underplanted after the establishment of more resilient pioneer species such as pines, eucalypts or alder as a nurse crop, and the management and protection of the resultant mixed crop for the understorey, not the trees, which may be a difficult concept to instil.

Grazing of livestock and fire during the artificial or natural regeneration of bamboos is an issue that should be considered, as delicate and palatable plants can easily be destroyed while still young. New bamboo shoots are readily broken by livestock in the summer so that bamboos are not suitable where free-grazing is to be practised. However, if tall offsets of bamboo are planted they can be successful without fencing or protection where other palatable plants would soon be destroyed.

During replacement of jhum cultivation with more intensive, permanent forms of agriculture, re-establishment of soil structure and fertility is an issue of critical importance. Nutrients are transferred from non-cultivated to cultivated land in a spatial rather than temporal manner, and they are generally best transferred through manure from an expanded collection of stall-fed livestock. This requires cultivation or collection of fodder, often from woody plants at certain times of year, and bamboos provide one of the most nutritious and palatable forms of fodder available from any woody plant. In this way bamboos could form a valuable component of a broad-based intervention following a farming systems approach, rather than forestry alone.

Canes should be restricted to sites where long-term tree support is available, and where frequent access is not necessary.

3.2 Land Tenure

Bamboos and canes are no different from other crops in that sound management is largely dependent upon security of ownership of, or at the very least formalized guaranteed long-term access to the resource by stakeholders who wish to make direct use of it. However, it may be noted that in areas where this is not achievable for certain reasons, bamboos by their natural coppicing ability are more likely to recover quickly after moderate abuse than most tree species.

At the present time it is not apparent that development of bamboos will bring large financial returns. There may not be sufficient profit in bamboo production if benefits have to be shared

between landowners and tenants or landless labourers, as well as a series of middlemen, officials as well as industrial entrepreneurs and even insurgents, especially if adverse land-ownership discourages good management in the first place. As an incentive to sound sustainable management of bamboo crops and to ensure equitable returns for stakeholders, land tenure is clearly an issue of paramount importance.

It is understood that although many reports have outlined a predominantly communal ownership of land in Meghalaya, over the past decades the majority of areas rich in bamboos have passed into individual private ownership. It is apparent that the poorer sections of the community may have not always been included in this process, and it also appears that there are no ceilings on individual land ownership. One report to UNDP this year studied problems facing groups of bamboo and cane craftspeople. It found that most of the land in each of five villages in Meghalaya was owned by a single person. This made it difficult for artisans to grow their own bamboo, and not surprisingly the existing bamboo and cane resources were not being managed in a sustainable manner, so that raw material supply and high cost has become a serious constraint. Other reports suggest a slightly less feudal system elsewhere, but inequitable land distribution is probably a serious constraint in most areas. The effects of this on the viability of investing in the forestry and bamboo sectors, and whether sufficient benefit would accrue to the poorer sections of the community would require careful consideration.

3.3 Integration of Institutional Activities

Many institutions would need to become more actively involved in broad development of sustainable management and utilisation of bamboo and cane. These institutions can be separated into those whose activities are connected more with supply, and those more involved in the use of or demand for bamboos. All the various institutions need to function in a collaborative way for ventures such as bamboo/cane to succeed. This would seem to require the overall supervision of an umbrella institution. Several institutional arrangements could be availed of. The on-going IFAD Community Resource Development Project for the Upland Areas provides one model. Many natural resource development schemes require considerable infrastructural development for them to become effective, and the inclusion of activities to expand and improve the rural road infrastructure to link the producers more effectively to markets, both for input supply and marketing of their produce, may need to be investigated.

The demand side of bamboo and cane development is currently being addressed by UNDP/UNIDO Project IND/97/160, Cane & Bamboo Technological Upgrading and Networking, implemented through the Department of Science & Technology, with INBAR co-opted for technical backstopping. The Project provides training of trainers for skill development in the North East, also in Meghalaya, and will establish a Bamboo Resource and Demonstration Centre in Gowahati to serve the needs of the North East.

At present there are few institutions with active natural resource extension capability in public, private or civil society sectors. The on-going IFAD-project is concentrating efforts on local grassroots capacity building at the moment, but is already facing problems in involving the technical line departments, which are supposed to be linked to the village-level natural resource management groups. The success of this program is considered to be of paramount importance to improving eventual natural resource management, including bamboo and cane activities. The model of participatory natural resource mapping and planning should be the foundation for any further IFAD-activities in the natural resource, such as forestry, development.

Involvement of representative and respected traditional local authorities would help to formalise such activities, at the same time giving strength to those traditional institutions. However, considerable reform of those institutions is first required, including opportunities

for women's true participation, and formalizing the detailed recording of proceedings and decisions with respect to land. Although the ADCs are often considered to have authority over the bamboo forests of Meghalaya, it would seem that as most of the forest is now in private rather than communal hands, their role is currently being questioned.

Considerable institutional capacity building is evidently required, as extension activities are not presently effective. Entirely new institutional arrangements might need to be considered, such as incorporation of the extension activities of the agriculture, forestry, livestock, and horticulture departments under one mechanism. The establishment of local natural resource centres through public or private sector, such as via NGOs, might be considered.

3.4 Economic Incentives

At the present time pulp mills provide the main demand for bamboo in the North East. The economics of pulp and paper are beyond the scope of this report, but certain suspicions require closer investigation, as by setting a value for the most basic but most widely utilised bamboo material pulp mills influence the entire bamboo sector.

Most of the bamboo forests in mainland India produce low quality culms from relatively unproductive species growing naturally with little management or input in government-owned forest, often on inherently unproductive sites. This is in stark contrast to the situation in the North East.

It may well be that the prices paid by the pulp mills are still artificially low, and are not representative of the real value of the resource. This certainly has been the case in the past, when concessionary rates were given to pulp mills. However, if international pulp and paper prices are particularly low for various reasons, low raw material prices might be keeping the industry viable in India.

If this were so then the industry would be subsidised in a manner that discourages any improved management of bamboos to boost productivity, and prevents profitable exploitation of privately owned bamboos, especially in less accessible localities where transport costs are higher, thus preventing owners of bamboo in more remote areas from benefiting from an important or even principal renewable natural resource. Other means of supporting the Indian pulp and paper industries such as tariffs on imports from non-sustainably managed sources of pulp and paper elsewhere in the world might be more conducive to sustaining bamboo-related livelihoods in the North East.

Present incentives to production in the region include subsidised transport costs within and to/from the region. Whether these are sufficient to encourage activities is a further issue. It has been reported that the subsidies are difficult to obtain in reality. For bamboo and cane as opposed to timber, transport is a particular concern as the materials and the end products are relatively light and more expensive to transport. The use of techniques to make products more compact may be important. This could involve the use of mobile chippers to reduce volume for pulping material, or the design of cane furniture that stacks well.

3.5 Socio-economic Factors

Development of the utilisation of a material such as bamboo that currently supplies basic housing needs for the rural poor could have the potential to disadvantage vulnerable groups unless carefully planned. Community supplies of bamboo should be ensured before developing private exploitation of the resource.

All bamboo enterprises involve marketing and this should be arranged to maximise returns for the producers and reduce exploitation by traders. If bamboos are currently unproductive and under-utilised one reason may be that too many people expect to profit from them. If landowners, cultivators, harvesters, officials, middlemen and entrepreneurs all require their cut, then an entire enterprise can ground to a halt. On the other hand, establishing community and small scale farmers' land-ownership rights, and effective co-operative marketing can exclude some of the vested interests and allow producers to recoup more realistic returns.

Development of the use of bamboos should not be based upon a model of landless labourers dependent upon one source of employment and a resource out of their own control. One plan for production of bamboo mat board in Meghalaya suggested employment of 40,000 village weavers across the State, buying bamboo and each earning IR 75 per day, together producing 100 tons of woven mats every day for collection. With incentives and subsidies, an expected internal rate of return of more than 50 percent for this venture was highly attractive for the potential investors. One issue that requires consideration is whether the benefits of such an arrangement for rural populations in Meghalaya would be sufficient for them to take up such a form of employment on a large enough scale to make the venture viable. While some people would appreciate a low cash income, others already involved in other activities would hesitate before abandoning them to become full-time weavers of bamboo mats. Sufficient mechanisation of the mat production processes might be necessary to raise daily income rates for the weavers, before they considered taking up this occupation on any scale. Even then, they might still prefer to grow, harvest and sell the bamboo for weaving elsewhere. Highly labour-intensive semi-industrial occupations are not generally appealing to hill farmers.

Production of ornamental bamboo handicrafts is well suited to assistance with design and marketing in more exclusive and lucrative markets, especially on a 'fair trade' basis. It is not clear that the market for handicrafts is unlimited however. Purchase of ornamental handicrafts by urban middle classes is often a form of charity to some extent, and such items may not form a wise basis for too large an industry.

3.6 Flowering of Bamboos

Bamboos have a characteristic habit of cyclical flowering after a period of vegetative growth lasting up to 150 years for some species. This leads to remarkably high productivity in terms of woody stems throughout the vegetative period, without wastage of growth potential on flower production. However, for some species it leads to severe interruption of production for a period of several years, both during the eventual flowering event and during the subsequent re-establishment of full-size clumps or stands from seedlings or surviving underground rhizomes. For this reason, reliance should not be placed upon one species of bamboo alone, and accurate scientific knowledge of the identities of the species cultivated and their precise flowering habits would be highly beneficial. It is not clear that such scientific knowledge exists at the present time.

It is understood that some authorities in India expect the spreading species *Melocanna baccifera* to flower over the next few years. It has been suggested that the availability of huge volumes of dying culms should be exploited commercially as a matter of urgency. However, large-scale utilisation of a species likely to flower in the near future might not be conducive to steady sustainable development, or making the best use of the considerable investment requirement in technology, institutional arrangements, and human resources. It might be more appropriate to channel limited public resources to a sustainably developing resource base, and to use a major flowering event as an opportunity to regenerate more widely, to plant different crops if appropriate, and to plan effectively for future management.

3.7 Research

The knowledge base concerning bamboos and canes in the region is evidently a constraint to efficient management, utilisation and conservation of the bamboo and cane resource, particularly so for canes.

Precise information on matters of plant growth is dependent upon accurate identification of the species involved. Identification of bamboos and canes has been abysmal in the past and remains at best sketchy now in the North East. Flowering information is especially dependant upon sound identification of species, and this was particularly unreliable in historic time-periods when the last flowering events occurred. Therefore, much of the information on flowering habits of indigenous bamboos is rather unreliable. Much other technical knowledge in both production and utilisation areas is based upon situations abroad or in mainland India, and may require adaptation to the situations prevalent in the North East.

All areas from identification and conservation through flowering, silviculture and management to utilisation require adaptive and sometimes fundamental research inputs. However, some of these would fall outside the scope of a supply-side project. For example, it has been suggested that the most basic equipment for splitting and slivering indigenous bamboos is still not available. Imported machinery is apparently not suitable for Indian bamboos, and adaptive research is still required to provide suitable equipment to replace hand splitting, slivering and manual weaving, all of which can now be automated in China.

As stocks of large diameter cane diminish, there may be a need to incorporate bamboo components into cane furniture instead. This will require a research and design component for the hybrid furniture. Local personnel and institutions would benefit greatly from support and exposure to collaborative research and development approaches on a regional and international basis.

3.8 Training

In the North East lack of technical knowledge at nearly all levels is a major constraint to development of renewable forest resources. Important developments abroad and in mainland India are not well understood. Broad issues such as land tenure, rural development, participatory forest management, and gender seem to have received little attention. Specific knowledge among line department, local council and NGO staff is lacking on general matters such as extension or integrated land management and farming systems approaches. Detailed knowledge of matters such as bamboo and cane identification, or sustained management and propagation of bamboos and canes is also lacking. There is also a lack of training of artisans, although this is currently being addressed by a UNDP/UNIDO project. The embryonic state of the more advanced bamboo–based industries such as laminated board, flooring and structural components and bamboo shoot preservation means that training in skills relevant to these industries will also be required in the future.

Long-term reorientation, training and institutional capacity building will obviously have to be a large component of future bamboo and cane development activities in order to tackle these major constraints. Institutional development and integration is required from the grassroots through local government (which requires reform) to State government, line agencies and NGOs, before sound management and sustainable exploitation of bamboo and cane resources can be expected.

X. CONCLUSIONS AND RECOMMENDATIONS FOR SECTORAL DEVELOPMENT

Considering that the forests of the North Eastern Region cover 26 percent of the total forest area of India, although the region constitutes only five percent of the entire country, and that the total forest cover in the region is about 64 percent of the geographic area as against the national average of 20 percent, the forests in the North East constitute an enormous renewable natural resource. Yet, the forest cover in the region has rapidly been decreasing due to indiscriminate felling for timber and intensified jhuming, while at the same time large proportions of the rural communities live in poverty. In Meghalaya the forests cover close to 70 percent of the total land area, but are declining under severe pressure from shortening jhum cycles, and lack of management practices for sustaining and regenerating the forestlands under private or communal ownership and control. Ninety-six percent of the forestlands in Meghalaya are under private or communal ownership. State-owned forests constitute the rest.

Intensive jhuming practices in the privately owned forests are estimated to have decreased the forest cover in Meghalaya by 57,000 km2 in 1995-97. The quality of the standing stock is steadily degenerating, biodiversity is being lost and valuable NTFP species are being depleted. Loss of soil nutrients, soil erosion and increasing landslides affect the crop production and infrastructure. As a result, the degradation of the forest resources will ultimately threaten the livelihoods of the rural populations.

Yet, Meghalaya also has a rich bamboo flora with 20-30 species already providing basic needs for a large proportion of the population, as well as exports, presently principally raw material. Rattans are abundant below 1,000 m, although their identities, distributions and extent have never been studied. Bamboos are very effective in soil and soil fertility conservation on the steep slopes of the hilly terrain of Meghalaya, which is prone to soil erosion. In such upland areas the most productive land use forms often are based on intricate crop mixtures planted according to details of micro-topography. Bamboos are easy to incorporate and manage under these conditions. Rapid nutrient recycling makes them also an effective component of a mixed fallow crop for areas that remain under jhuming.

Much of the forest land of Meghalaya has the potential to grow a wide variety of valuable tree species. If the open forest areas, which are being rapidly denuded, were to be upgraded to the dense forest category through sustainable management, 95 million m3 could be added to the standing stock. However, introduction of multipurpose forestry to produce a mix of products such as timber trees with different rotations, bamboo, rattan, broom stick, mushrooms, honey, aromatic and medicinal plants and trees, etc. would better enhance the livelihoods and cash earning opportunities of the rural populations. Biodiversity would be increased, and the negative effects of a potential market failure for a single forest product would be neutralized.

The potential demand for bamboo and cane products is sufficient for considerable expansion of the sector. Neither potential supply of the raw material nor potential demand are constraints to the development of the bamboo resource, but increasing supply of rattans does seem to involve intrinsic difficulties in that sector.

Lack of sound management practices and poor utilization of the potential of forestry in Meghalaya, and assumingly in all states of the North East, suggests that there are serious constraints, which have to be addressed, while developing sustainable forestry for the benefit of the poorer segments of the rural populations. The major issues include land tenure and land use, forest administration and its capacity constraints, forest legislation and incentive policies, the access of the poor rural communities to credit, inputs, and market information as well as to physical markets.

The major issues have been discussed in detail in Chapters VI (1 and 2), VIII (3 and 4) and IX in the report. It appears that by introduction of sustainable multipurpose forestry to Meghalaya, the rural poor can be assisted to enhance their income earning potential substantially, while at the same time environmental degradation will slow down, and the negative impact of reduced forest cover on various sectors can be reduced. Sectoral development, which could be initiated through an IFAD-financed investment project, requires, however, resolution of the major issues. While an IFAD-project following the successful concept of the on-going North Eastern Region Community Resource Management Project for Upland Areas would provide investments for development of household level livelihood and income generation, it should also contribute to policy dialogue for forestry development. Since the focus of the present GOI forestry policy is poverty reduction, and recognition of the rights of indigenous populations as users of multipurpose forestry, development of a suitable extension approach to benefit the poorer segments of the rural populations should be feasible through an IFAD-project.

The Mission sees that at the village level the model of joint land use planning and decision-making introduced through the natural resource management groups of the on-going IFAD-project could be used for land use planning with specific objective of forest activities. Also, while land tenure remains under customary laws, and is not comprehensively documented, decisions on forest management can best be achieved through a broad-based village organization, where the more influential members are represented, but which protects the poorer households, and allows women's participation in decision making. In an eventual new IFAD-forest development project the focus should, however, be on institutional development and capacity building to create an extension service capable on advising the communities and the poorer households on multipurpose forestry. Since this does not exist in Meghalaya, either major reorientation of the present forest administration needs to take place, with consideration being given to the utility of ADCs in forestry extension, or private sector services need to be set up - either through NGOs, although their present capabilities are weak, or through some other form.

The Mission proposes that in order to proceed with sectoral development, and design of a potential investment project the following further studies should first be undertaken:

(v) a review of the land tenure situation, with recommendations for formalization of the tenure arrangements, and for formalizing the customary practice of land ownership through the female lineage in the family;
(vi) preparation of a proposal for institutional development of the forestry administration in Meghalaya, with a proposal for private sector involvement in forestry extension, as well;
(vii) species and distribution inventory for forest trees, bamboos and canes, and NTFPs in the North East to firm up knowledge of the resource and its locations for gaining adequate understanding of the conservation requirements and potential for exploitation; and
(viii) an assessment of the rural infrastructure, such as road network, and its renovation and development needs in view of improving the market links.

Draft outline of the terms of reference for the studies is attached (Annex 4).

The Mission proposes that all stakeholders, including the village level, technical line departments, NGOs, and others should be involved in the process of planning the IFAD-project. Only then the implementation modalities selected can be sound, and it is realistic to expect involvement of the stakeholders. Normal technical inputs such as economic and financial analysis, etc. needed for design of an investment project, need to follow these specific studies.

Later studies should include a species by species investigation of the requirements and silviculture of major bamboos and canes. Incorporation of these into farming systems models for the North East would be appropriate. Adaptive research should involve interaction between line departments including Silviculture Wing of the Forestry Department, Agriculture Department, Livestock Department, local and regional research institutions including BSI, NEHU, as well as the international agencies such as INBAR and IDRC.

Many critical elements, such as promotion of household and village-level processing of NTFPs, linking the producers to market channels, creation of market information systems, facilitation of the access of Self-Help Groups to credit, etc. belong to the scope of the on-going IFAD-project. Since there has not been any other similar attempt on a larger scale ever in Meghalaya, nor is any other similar development project planned, the experience gained from the on-going project will be very valuable for promotion of wood, NTFP, bamboo and cane-processing activities at household and village level.

The banking sector in the North East is devising mechanisms for delivery of microcredit to the rural poor, mainly through lending to NGOs, which will on-lend to village-based Self-Help Groups. The existing public sector skill development, vocational training and small enterprise promotion network with its schemes for subsidies can provide assistance for setting up small-scale processing enterprises in the villages, if only properly tapped. Again, the natural resource management group-type of a village organization can be effectively used for disseminating information and establishing linkages between the producers and the service providers. There are also attempts presently in the North East to establish an NGO-coalition, which - if activated - will strengthen the local NGOs, many of which have natural resource management and poverty reduction on their agenda, but their current activities are on a very small scale, and mainly awareness raising.

An interesting consideration would be to develop a regional program of activities, encompassing several neighboring territories, if one were to consider larger watershed management-approach as basis for regional development of natural resource management. This could entail the Tsangpo/Brahmaputra Watershed, including Nepal, West Bengal, Sikkim, Bhutan, North East India, Tibetan Autonomous Region of China and Bangladesh. This could tap on benefits of synergism accruing from regional collaboration and communication. Benefits would stem from activities such as improving communications and infrastructure for transport and marketing of goods, improving knowledge base and exchange of information on agriculture, management of forests, fisheries, wildlife etc., scientific collaboration, exchange of best practices and exchange of genetic material for tree species, bamboos, medicinal plants, canes, etc. Areas of collaboration would aim to improve land management systems for upland agriculture, forestry development, wildlife conservation and stimulation of ecotourism. Institutional arrangements should make best use of existing networks and institutions including ICIMOD in Kathmandu, IDRC in Delhi and INBAR in China. Agencies such as UNDCP (United Nations Drug Control Program) might be particularly interested in collaboration with IFAD for such a regional program because of the importance of collaboration across the national boundaries for control of the drug trade and provision of alternative sources of cash income to the producers.

ANNEX 1

ANNEX 2

NON-TIMBER FOREST PRODUCE (NTFP) OF GOOD POTENTIAL IN MEGHALAYA

1. Broom grass (*Thysanolaena maxima)*

Broom grass grows naturally in degraded forests and on wastelands of the hilly areas of the North Eastern Region. The inflorescence of the plant is used as brooms in many parts of India. The leaves of the plant are used as fodder and fuel, while the stems are used as raw material in the pulp and paper industry.

The shifting cultivators in Meghalaya have a long history of broom grass cultivation. In certain areas it has become the second most important crop after rice and has proven to be a viable alternative to jhuming. The success of the broom grass lies in its need for little input and an established market.

Broom grass is traded mostly by middlemen who usually go to the villages and contract entire plantations. Also MECOFED buys from the producers. MECOFED as well as the traders sell their broom grass in Mumbai, Calcutta and New Delhi, where the grass is made into brooms and exported. Similar brooms are produced also in other Southeast Asian countries.

The broom grass plant starts yielding after 6-12 months and can be harvested annually on a six-year rotation. The grower can earn an average net profit of IR 3,330 per year . For every rupee spent on broom grass cultivation the grower earns a net profit of IR 1.30 (B.K.Tiwari/2000).

The broom grass plant is said to deplete the soil of nutrients. Although it is natural that a fast growing tall grass needs a lot of nutrients, the situation is hardly much different than if maize is continuously grown in one place without any fertilizers.

2. Mushrooms

The rural communities rely on the forests for a great number of food items. Some of the more important ones are wild mushrooms. For example, Shitake-mushrooms grow wild on oak and castanopsis. The mushrooms are consumed fresh or they are dried for future use.

Mushrooms are seasonal with substantial variations in yield. Introduction of mushroom cultivation in the villages could give the farmers a steady yield of mushrooms from six to eight months a year. Dried mushrooms can easily be transported and sold to far away markets.

The Agriculture Department of Meghalaya has developed cultivation techniques suitable for village level production for button mushrooms as well as oyster mushrooms (*Pleuretus spp/"Dhingri").* Cultivation of button mushrooms is restricted to the high altitudes of 1,000 m and above due to its requirement for low temperature (15-28 degrees C). The spawn (seed material) is provided by the Department at a 50 percent subsidy. One packet of spawn costs IR 4 and covers one growth block made out of paddy straw. One block produces about 1.5 kg of mushrooms. At a production level of 1,250 kg per year the estimated net income for the producer is IR 20-25,000.

Unfortunately, button mushrooms cannot be dried easily, and the production must be sold fresh very soon after harvesting. Button mushrooms are frequently sold to Gowahati and even to Calcutta.

The oyster mushroom requires warmer growing conditions. One big advantage of the oyster mushroom is that it can be easily dehydrated.

3. Apiculture

Production of honey can generate good cash income to the rural households. Honey has a good market in India and the product can even be exported. Some Indian companies are involved in commercialized honey production. The honey market is, however, poorly organized and the producer needs assistance in finding the right marketing outlets.

Bees are usually reared in boxes (beehives) made of tree trunks. The bees are collected from the forest. One beehive produces about five kg of honey and one kg of honey fetches IR 100-130 on the local market.

The Khadi and Village Industries Board in Shillong has developed a scheme for honey production involving 35 villages. The program would provide training, beehives, centrifuges, machinery for packaging and other material for the establishment of a joint honey-processing unit for villages, which produce honey. The Board would buy and market the honey. The program has not started yet due to shortage of financing.

4. Aromatic and Medicinal Plants and Trees

Although a wide variety of wild aromatic and medicinal plants are collected and either used by the villagers themselves or sold to traders, there is, so far, no information available on the quantities involved. The following are some of the important species:

- Atis root (*Aconitum hethophyllum);*
- Satamul *(Asperagus racemosus);*
- Indian Berberis *(Berberis aristatus);*
- Yew *(Taxus wallichiana&baccata);*
- Gamari (*Gmelina arborea);*
- Tulsi *(Ocimum sanctum);*
- Amla (*Phyllanthus emblica);*
- Sarpagandha (*Rauwolfia tetraphylla);*
- Arjun (*Terminalia arjuna); and*
- Hollarrhena (*Hollarrhena antidysentrica).*

Some of the aromatic and medicinal plants and trees could be cultivated on a commercial basis by the village communities. The leaves of the wild *Taxus* tree are exported in large quantities to the US for the extraction of Taxol, a substance used for fighting cancer. Unfortunately, in the process the trees are cut and only few trees are any longer found wild. However, it is possible to cultivate and harvest *Taxus* trees on a sustainable basis, more or less like a tea crop. The *Taxus* yields for the first time after three years and it can be harvested twice a year during the next seven years.

Citronella

Citronella oil derived from *Citronella* grass is a major essential oil used by the cosmetics industry. The Citronella grass grows on sandy loamy soils. It needs moisture to grow well, but does not withstand waterlogging. The grass is planted during the rainy season and about six cuttings are possible in a year. The average life of Citronella grass is about five years. The conditions for cultivating Citronella grass are highly favorable in the North Eastern Region.

Citronella oil constitutes over 90 percent of the production of essential oils in India. The major buyers are manufacturers of cosmetics and perfumes in Mumbai, Bangalore and Madras.

The procurement of Citronella oil is dominated by Hindustan Lever Ltd., Industrial Perfumes, K.V. Aromatics and Gupta&Co.. Their procurements increased from 1,200 tons in 1992 to 3,000 tons in 1996. The procurements increased by about 450 tons annually. The present demand for citronella oil is estimated to be around 4,500-5,000 tons per year.

The Indian citronella oil has to compete with production from Indonesia and Sri Lanka. The oil produced especially in Assam is said to be of a better quality than the competing products. Citronella is produced in Meghalaya, Arunachal Pradesh, Nagaland and Manipur.

The capacity of a citronella oil plant depends mainly on the size of the distillation stills. Plant capacity may vary between 500 kg to 1,000 kg of grass per distilled batch. A plant with a daily output of 24 kg of citronella oil and an annual production of six tons requires about 750 tons of grass. The total investment for such a plant is in the region of IR400,000. The technology is available at the Regional Research Laboratory at Jorhat, Assam.

Turmeric

Turmeric is an important condiment and a useful dye with many uses in drug and cosmetics industries. It is used medicinally for external application and is taken internally as a stimulant. A type of starch can also be extracted from a particular type of turmeric. The byproducts from the polishing of turmeric are used as fertilizer as well as for incense sticks.

India is the largest producer of turmeric in the world. Andhra Pradesh and Tamil Nadu jointly account for 50 percent of the production. The total production of turmeric in India in 1991 was about 350,000 tons. Most of the turmeric is consumed in India. Only about eight percent is exported.

Polishing adds the commercial value of turmeric. Before the polishing the harvested rhizomes are cured through a cooking process. After drying the turmeric is polished either by manual rubbing or in mechanical polishing drums. Dried and polished turmeric is stored in gunny bags.

The technology for curing and polishing turmeric has been developed at CFTRI in Mysore. CFTRI also provides the necessary technical expertise for the process. All machinery is available from Indian manufacturers. The total cost of a small-scale operation is estimated at IR 230,000.

Ginger

Ginger is commonly cultivated. The ginger roots are used as food, spice and for various medicinal purposes. During recent years ginger extract has become a popular natural medicine for various ailments, such as rheumatism.

The local demand for ginger in the North Eastern Region appears to be good at the moment. The State Government of Mizoram has sanctioned a loan of IR 70 million for ginger cultivation. In 2001 ginger is expected to be the biggest cash crop to be exported from Mizoram (The Assam Tribune, November 2000). Ginger is one of the first cash crops selected by the farmers also under the on-going IFAD-project in Meghalaya, although the marketing opportunities are not yet ascertained.

5. Other NTFP-Based Products

Disposable leaf plates are widely used in India. The leaves of sal and teak are used as such or in a more sophisticated manufactured version with a polythene film surface pressed on to the

leaf-base. According to a calculation made by DIC of Meghalaya the investment cost of a unit producing 200,000 sets of plates and bowls per annum is IR 75,000. The annual requirement of bundles of leaves is 1,000. The leaves would be collected by the villagers and sold to a production unit.

ANNEX 3

BAMBOO SPECIES INVENTORIES

1. Species enumerations

Different reports have included many different species identifications and compositions, often in a mutually incompatible or contradictory manner. Similarly, the reporting of uses and distributions has been less than satisfactory.

This is not surprising, as literature available on Indian bamboos is inaccurate, itself contradictory, and usually does not contain sufficient information for field recognition. A thorough revision of the bamboos of India has in fact not been undertaken since 1896, and the bamboos of the Northeast remain the least well known in the country. Botanical Survey of India (BSI) in Shillong was not willing to meet with the IFAD team while they were there, but they have expertise in grass taxonomy. They might appreciate an opportunity to become involved in taxonomic and ethno-botanic research on the basis of national and international collaboration. INBAR recently commissioned a Compendium of Indian Bamboos by Kerala Forest Research Institute, but although coverage of the bamboos of South India was up to date, knowledge of the bamboos of other parts of India was less detailed.

Tewari (1993) listed 63 species for the Northeast, and 33 for Meghalaya (see below). The Silviculture Wing of the Forestry Department in Meghalaya reported that they thought that 22 different species were present in the state, although they could not be scientifically identified. Forestry Department inventories have not distinguished between the bamboo species except to categorize them as clump-forming or non clump-forming ones. The plot enumeration form (PEF) requires a species name for bamboos, but without any identification guide that is evidently not possible.

The bamboos commonly planted in mainland India, *Dendrocalamus strictus* and *Bambusa bambos* (syn. *Bambusa arundinacea*) are probably not indigenous to the Northeast, and were not seen during the mission.

Species seen during brief field trips are listed in Appendix 1.

2. Bamboos of Meghalaya (from Tewari, A Monograph of Bamboos, 1993)

Bambusa jaintiana
B. khasiana
B. pallida
B. polymorpha
B. pseudopallida
B. teres
B. tulda
Cephalostachyum capitatum
C. fuchsianum
C. pallidum
Chimonobambusa callosa
Chimonocalamus griffithiana
Dendrocalamus calostachyus
D. hamiltonii
D. hookeri
D. sikkimensis (Garo hills)
Drepanostachyum hookerianum
D. intermedium
D. khasianum
D. kurzii
D. polystachyum
D. suberectum
Gigantochloa albociliata
G. apus (Garo hills)
G. macrostachya (Garo hills)
Neomicrocalamus mannii (Jaintia hills)
N. prainii
Phyllostachys mannii
Teinostachyum dulloa
T. griffithii
T. helferi
Yushania hirsuta
Y. microphylla

Appendix 1

BAMBOOS ENCOUNTERED DURING FIELD VISITS

A. The three most common indigenous species

1. Dendrocalamus hamiltonii (Local name in Ri-Bhoi *Kokai*; in Nongpdeng *Seij Khlaw*)

This tall pendulous thin-walled clump-forming bamboo is the principal natural species of the outer Siwalik hills of the Himalayan range and continues through low hills of NE India, Burma and Bangladesh.

Recognition is by the matt green culms, the sparse patchy culm sheath hairs, triangular culm sheath ligule, dentate centrally arcuate culm sheath ligule, and the long leaf sheath ligule. The central branches are very large, and arise vertically from the arching culms.

Confusion with *Dendrocalamus strictus* has led to it being identified as that species in some reports. The characteristics above separate it readily from that species, which is shorter, much more erect, and has thick-walled or even solid culms.

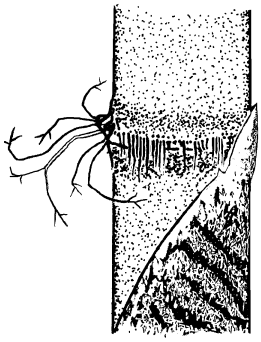
D. hamiltonii has thin walls, making it less useful as a species for construction, but good for weaving, and the shoots have the best flavour of all Indian bamboos, and are widely harvested. The large leaves are also widely used as a source of animal fodder in the winter.

A marked distinction is seen between clumps managed for culms, which have relatively well separated culms, and those managed for shoot production, which are consequently dense and congested, with no young culms on the outside.

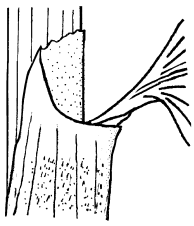
Different varieties of this species are found, some reportedly giving better edible shoots than others. Further identification is required to ascertain which particular variety or varieties are present in Meghalaya.

The variable flowering habit of this species is well documented. Gregarious flowerings over a restricted area of one or several districts occur every 30 or so years. In addition sporadic flowerings of a few culms within a clump, a single clump or several clumps frequently occur within the vegetative phase. Seed production is usually good, even from sporadic flowerings. Natural regeneration was seen in protected forest (Ri-Bhoi District).

In addition to suitability for traditional weaving, culms of this species are suitable for splitting into slivers for mat board, and the shoots are eminently suitable for preservation.



Culm and culm sheath of *D. hamiltonii*



Leaf sheath with long ligule

2. Melocanna baccifera (Local name in Nongpdeng: *Tyrlaw*)

This medium height very straight thin-walled spreading bamboo forms large stands rather than separate clumps. It is most abundant in Bangladesh and Burma.

Recognition is by the very distinctive culm sheaths, with a few large corrugations towards the top and a very large sword-shaped reflexed blade. The culm internodes are long and the branches are small and uniform in size. The rhizome has a long neck that is thinner than the culm but is thick below the base of the culm (pachymorph).

It might be confused with the other spreading bamboo in Meghalaya, *Phyllostachys mannii*, but that bamboo is generally smaller and has only two branches at each node.

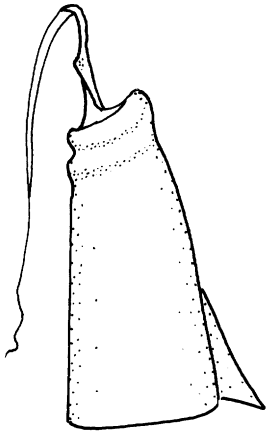
The fruits of this species are peculiar for a bamboo, being large, almost the size and shape of a small pear. They cannot be stored, and germination often takes place while the fruit is still attached to the parent plant.

M. baccifera has thin walls, making it less useful as a species for construction, but good for weaving, especially as the internodes are long and the branching is light so that the culm nodes are not swollen.

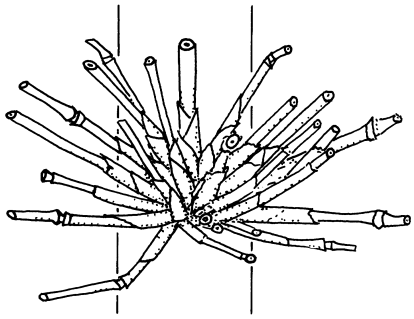
Because this is a spreading bamboo it has very upright culms. This makes it more suitable for certain purposes where the curving nature of culms from clump-forming bamboos is a disadvantage.

In addition to suitability for traditional weaving, culms of this species are very suitable for splitting into slivers for mat board. The shoots are not edible. This species is highly regarded for production of pulp for paper manufacture, and is considered the most desirable bamboo species by local pulp mills.

This species is reported to die after flowering. Estimates of the time between flowering cycles range from 30 to 60 years. Blatter reported in 1929-30 that ‘the data at present available are not sufficient to justify any definite conclusions’ and it does not seem that knowledge of its flowering behaviour is any better now.



Culm sheath of *Melocanna baccifera*



Mid-culm branching

3. Bambusa nutans subsp. cupulata (Local name in Ri-Bhoi *Jathi*; in Nongpdeng *Rynnai*)

This tall thick-walled clump-forming species is the principal *Bambusa* species of the entire Himalayan range and continues through the Brahmaputra Valley and down to the Bay of Bengal, and right through the low hills of NE India and Burma.

Two subspecies are known. The eastern subspecies was once described as a separate species and given the name *Bambusa teres*, but that name was hardly ever used. It has nearly always been known in the NE Himalaya and NE India as *Bambusa nutans* (other local names *Mal Bans*, *Makla Bans*), so now it is recognized as a subspecies within that species rather than changing to the name *B. teres*.

It is distinguished from the western subspecies, which is found from Dehra Dun to Malangwa in the Nepalese terai, by the large, cupped, deciduous culm sheath blades that give it the subspecies name *cupulata*. It has unfortunately been misidentified on many occasions as *Bambusa tulda*, an inferior species rarely found in the hills.

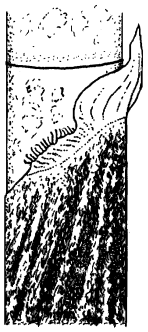
As well as having large cupped culm sheath blades, the culm sheath has jet-black hairs, and broad, rather oblong auricles with long wavy bristles. Culm nodes have white rings above.

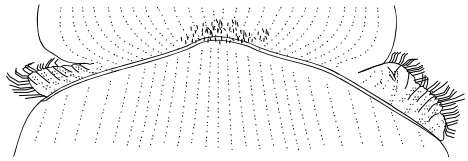
Culms of this species are quite thick-walled, but not subsolid, and the internodes are quite long and very straight. This makes it a versatile species, with culms that are strong enough for constructional purposes, but still usable for weaving rough basketry and mats for rural purposes.

This is the most widely planted bamboo of the region, cultivated around houses for constructional material to supplement thin-walled bamboos found growing naturally.

This is another excellent bamboo, which is suitable for both ancient and modern end-uses. The shoots are very bitter, however, and the leaves are small, making it less than ideal for supplying animal fodder. It tolerates drier sites than other indigenous bamboos.

Little is known of the flowering habits of this bamboo, as its identification has been unreliable in the past. It does not seem to flower sporadically and seed has rarely been seen.





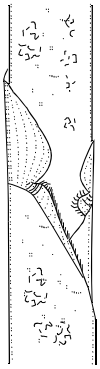
Culm sheath of *Bambusa nutans* subspecies *cupulata*

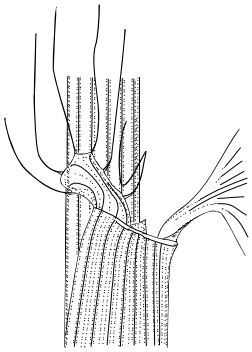
B. Other less common indigenous bamboos

4. Bambusa jaintiana (Local name in Nongpdeng: *Shken*)

This is a smaller stature *Bambusa* species, only reaching 10m in height and 4cm in diameter, but with larger leaves than those of *B. nutans*.

Uses are not known in detail, but this is similar to the Chinese bamboo known as Weavers' Bamboo, *Bambusa tuldoides*, and this is presumably also a good species for weaving, having long internodes, straight culms, and relatively light branching. Identification is by the narrow culms without a white ring above the nodes, the culm sheath auricles, which are often very long, and the tall white bristles on the leaf sheaths.





Culm and culm sheath of *B. jaintiana* leaf sheath with tall bristles

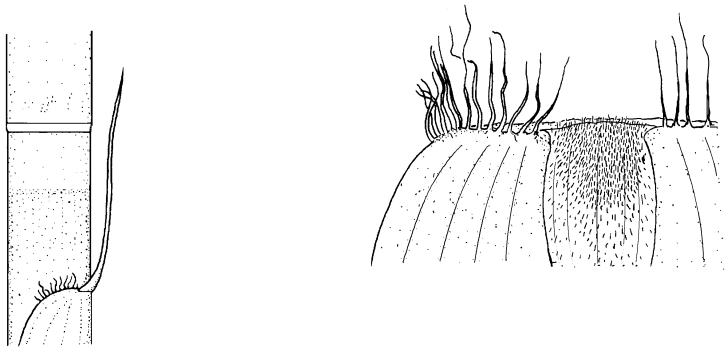
5. Cephalostachyum capitatum (Local name in Nongpdeng: *Laa*)

This is another medium stature clump-forming species, with smaller, thinner-walled culms than *B. jaintiana*. The culm sheath has a row of erect bristles at the top on each side, and the reflexed blade has dense hairs inside.

Culms are smooth, with very long internodes, and are readily split or crushed to make mats. This is reportedly the most desirable species for mat weavers from Assam, but it is not known how abundant the species is. As the local name in Assam for this bamboo is *Dulloo Bans*, it has usually been assumed that the species is *Teinostachyum dullooa*, but in fact that

unfortunately named species actually comes from Burma, where it has a different local name altogether.

It is not clear whether this species would have large enough culms for making slivers for bamboo mat board.



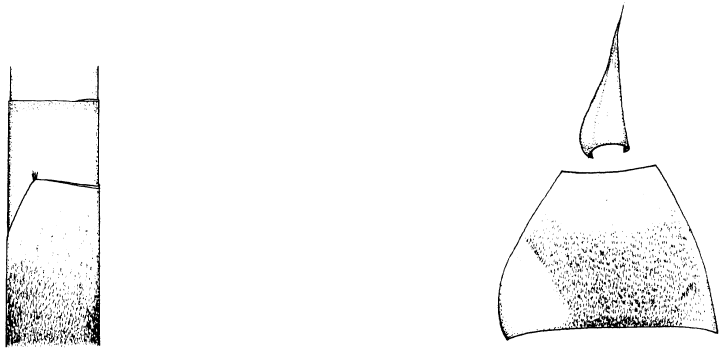
Culm and culm sheath of *C. capitatum*

C. Other important indigenous species of which only the culms have been seen (identification very tentative)

6. Bambusa balcooa ? - a strong thick-walled bamboo known as *Skong* in Nongpdeng.

Culm and culm sheath of *B. balcooa*

7. Pseudostachyum polymorphum ? – an extremely thin-walled spreading bamboo with short internodes, known as *Tyr Aa* in Nongpdeng.



Culm and culm sheath of *Pseudostachyum polymorphum*

D. Other small indigenous bamboos

A large number of smaller bamboos are found in Meghalaya including ***Drepanostachyum khasianum*** and ***Yushania hirsuta***, both of which were seen near Shillong. Such bamboos are highly localized and some may already be threatened with extinction by the deforestation of their natural habitats. Further study is required to decide the correct names for such small bamboos and whether they should be exploited or protected.

E. Non-indigenous bamboos in Meghalaya

Phyllostachys mannii – Local name *Seij Naga*. This is a spreading bamboo that reaches a height of 12m and a diameter of 4 cm, widely planted on the Shillong Plateau, especially as hedging.

Other bamboos, from China, Indo-China and Japan, planted for purely ornamental value were also seen in Meghalaya, including ***Phyllostachys nigra***, ***Bambusa multiplex*** (Cultivars 'Fernleaf', 'Rivierorum', and 'Whitestripe'), ***Bambusa striata*** (*Bambusa vulgaris* var *striata*), ***Pleioblastus viridistriatus***, ***Pleioblastus hindsii***, and ***Pseudosasa japonica***.

ANNEX 4

AN OUTLINE TERMS OF REFERENCE FOR FURTHER STUDIES FOR FORESTRY DEVELOPMENT IN MEGHALAYA

1. Land Tenure

- review and document the historic and current legal position on land ownership and tenure in the different states of the North Eastern Region;
- quantify approximate ownership and tenancy of lands within a selective sample of villages representing the different ethnic groups in Meghalaya;
- review patterns and changes in land use and the relationship to changes in land ownership and tenancy situation; and document particularly the situation concerning forestry;
- review the patterns and changes in communal ownership and access to land and land use; and assess whether the changing land ownership patterns have any relationship to changes in rural poverty;
- review and document the impact of changing land ownership situation and formal registration on women's position in the communities, and assess whether the changes affect their vulnerability;
- determine any patterns and trends by districts;
- assess how changes in legislation have affected traditional patterns of land ownership and land use;
- compare the situation in the North East to current land ownership elsewhere in India;
- consider and make recommendations on how documentation of land ownership and tenancies at village level could help to improve security of tenure for poorer sections of the indigenous village communities, and for women, who have been the traditional owners of land.

2. Institutional Development

- review the agencies presently involved in forest administration in Meghalaya, and their technical capabilities, and resources, including staffing and budgets;
- review the role and effectiveness of the Autonomous District Councils in forestry extension and advisory services;
- review the extension capabilities and practices of the forest administration to provide services to private landowners and rural communities, including village groups, such as natural resource management groups and Self-Help Groups;
- review whether there are any private sector, such as NGOs or other agencies, which provide forest advisory services, on management, processing or marketing, and the extent of their capabilities and resources;
- assess the access and preferences of rural communities to both public sector and private sector forest advisory services; and what are the costs involved;
- review the capacity building and training needs of both the public sector and private sector forest extension services with a view to enabling them to reach the poor rural communities and village groups interested in sustainable multipurpose forestry;
- identify and propose organizations (public or private sector) in the North East or elsewhere in India, which can be used in institutional development and training of the forest extension service and administration in Meghalaya and the North East;
- estimate the costs of the required institutional development and capacity building for the forest administration and/or private agencies in Meghalaya; and
- propose an institutional development and capacity building program for Meghalaya to create a forestry extension and advisory service for private and communal forestry activities.

3. **Timber, NTFPs and ethnobotanical enumeration**

- through village-level participation and direct investigation, document all naturally-occurring plants currently being exploited on a significant scale from forest and marginal land for timber, wood, non-wood forest products, food, medicinal value or other purposes;
- assess the approximate relative scale of current exploitation , relative abundance or scarcity, sustainability of extraction, and economic or other benefits;
- list major species of forest trees and other non-agricultural and non-horticultural crops currently being planted, and assess their relative economic and other values;
- list species of indigenous bamboos and canes, assess approximate distribution and uses, and gather information on past flowering behavior;
- for plants of uncertain identity make herbarium collections and deposit at Botanical Survey of India, Shillong for later investigation; and
- collate findings in appropriate formats.

4. Rural Infrastructure (rural roads)

If it is decided that the potential future IFAD-project would encompass a large scope, and would be expanded to an area development-type natural resource management project, an assessment of the road infrastructure, and its development by financing by a possible co-financier, might be necessary to improve the access of the rural communities to the markets. The assessment might cover the following:

- assess the rural road network in Meghalaya, particularly rural access roads, their condition, and rehabilitation requirements,
- assess the public sector resources for road maintenance, the status of maintenance, and revenue generation for maintenance, and shortfalls, if any;
- identify priority sectors for rehabilitation and construction of new roads, and a mechanism and criteria for final selection, as well as carrying out an environmental impact assessment and mitigation mechanism, in case of negative environmental impact; and
- identify appropriate unit costs for the representative conditions in Meghalaya.