

Executive Summary

Trees and forests in Bangladesh provide a wealth of resources in the form of nutrition, energy, medicine and materials which local communities heavily depend on. They are also valued for their contribution to soil and water protection, carbon sequestration and many other services. Nonetheless, these resources are under extreme pressure from rapid population growth, land degradation, and expanding industries. While Bangladesh is aspiring to become a higher middle-income country by 2021, sustainably using and conserving these resources is central to the sustainable development of the country.

Tree and forest resources of Bangladesh: Report on the Bangladesh Forest Inventory is a publication which summarizes the results of the first cycle of the inventory performed from 2015 to 2019. It includes national scale estimates from a land cover map and satellite land monitoring system, a forest inventory of 1858 plots, and a socio-economic survey of 6400 households. Each provides baseline information for sustainable tree and forest management and conservation. This system allows for stronger monitoring of both forests and Trees Outside Forest (TOF) and will be updated with results from future cycles.

The results of the Bangladesh Forest Inventory (BFI) are aimed to inform national plans and strategies for balancing sustainable development with natural resource conservation, in particular the Sustainable Development Goal 15 - Life on Land (SDG 15). The BFI process can also be intensified and enhanced to meet specific regional purposes. In summary, it is a comprehensive National Forest Monitoring System (NFMS) which applies the latest technologies to ensure reliable estimates of the country's tree and forest resources and will have a long-term impact on improving the management, conservation and benefits from trees and forests.

More than 30 government agencies, universities and NGO's assisted the Forest Department in completing the first cycle of the BFI by contributing to the design, trainings, data collection, data analysis and other components. The United States Agency for International Development (USAID), the Food and Agriculture Organization of the United Nations (FAO) and SilvaCarbon provided technical and financial resources to the process¹.

The following seven criteria embody this vision of sustainable forest management:

1. Forest extent and tree cover changes
2. Biological diversity and conservation
3. Growing stock, biomass and carbon
4. Management and ownership
5. Tree and forest disturbances
6. Support for sustainable forest management
7. Tree and forest services and livelihoods

¹ Other collaborators include US Forest Service, University of Maryland, National Aeronautics and Space Administration (NASA) and French Agricultural Research Centre for International Development (CIRAD).

Criterion 1 - Forest extent and tree cover changes (Section 3)

In 2015, forest cover in Bangladesh was 1,884,019 ha, or **12.8%** of the total country area using the FRA (2018) definition of forest cover². This amounts to 11.7 ha per 1000 people. When only terrestrial land area is considered (i.e. excluding river and lake area), the forest cover is 14.1%. Hill Forest is the largest forest type by area (4.6% of the country area) followed by Shrubs with Scattered Trees (4.2%) and Mangrove Forest (2.7%). Permanent Crops covered half of the country area and, although these areas are primarily used for agriculture, they still have an average tree cover of about 7%. Notable increases of average tree cover occurs within Mangrove Plantation (12% increase), followed by Mangrove Forest (4%) and Rubber Plantation (2%). The highest decreases in tree cover occurs in Plain Land Forest (Sal Forest) (18%), Shifting Cultivation (14%) and Hill Forest (7%).

Criterion 2 - Biological diversity and conservation (Section 4)

Biological diversity in terms of number of tree species per land cover is highest in the Hill Forest and Rural Settlements, where each have more than 240 different species. However, 63% of individual trees in the Rural Settlement are introduced species, compared to only 33% in the Hill Forest. Thus, humans are partially responsible for high biological diversity occurring within their own living environment while native tree diversity is preserved more in natural forests. In total, there were 12 threatened species identified in the biophysical inventory, occurring mostly in the Hill zone. At least two species in the Hill zone were determined to be globally Endangered or Critically Endangered (*Aquilaria malaccensis* and *Anisoptera scaphula*) per IUCN's Red List, although their status within Bangladesh was Vulnerable or Unknown.

Criterion 3 - Growing stock, biomass and carbon (Section 5)

Rural settlements are the largest source of the national growing stock volume which is 2.7 times higher than the volume in Forest area, contributing to **50%** of the total growing stock. Similarly, bamboo volume in the Rural Settlement is 59% of the total national bamboo stock.

Trees Outside Forest, which include Rural Settlement, contains **66%** of the total biomass. The highest biomass density occurs in the Sundarban zone. One fruit species (*Mangifera indica*), one introduced species (*Swietenia mahagoni*), and one mangrove species (*Heritiera fomes*), are the top three species by biomass in the country and comprise 19% of the national biomass. The highest supply of biomass that is usable for fuelwood (i.e. coarse woody debris, fine woody debris, and litter) is from the Hill Forest (3,408 tons biomass, or 33% of the total), but a substantial amount is also found in Rural Settlement (2,587 tons, or 25%).

The total terrestrial carbon stock (aboveground, belowground, dead wood, litter and 0-30cm soil) is estimated to be **1275.55** million tons. The majority of the country's carbon stock is held in soils to 30cm depth³ (80.5%), followed by aboveground biomass (15.3%), belowground biomass (3.6%), dead wood biomass (0.5%), and litter biomass (0.1%). Forest areas hold 21.5% of the total carbon

² The following land cover classes were considered as forest cover: Bamboo Forest, Forest Plantation, Hill Forest, Mangrove Forest, Mangrove Plantation, Plain Land Forest (Sal Forest), Rubber Plantation, Shrubs with scattered trees, Swamp Forest

³ Soil carbon was determined by LOI without removing carbonates and may yield higher estimates than other methods such as Walkley-Black.

stock in the country and Hill forest and Mangrove forest alone hold 9.7% and 5.2% of the total, respectively.

Criterion 4 - Forest management and ownership (Section 6)

There are 3.1 million ha of land, or **23.2%** of the total area, which have some form of tree and forest management observed by field teams. 48% of the managed land is some form of plantation (general, woodlot, coastal, rubber or strip), while the remaining managed land is mostly agro-forestry, tea garden, or orchard. Households collect most of their tree and forest products from privately owned lands in the form of energy (41% of total households), materials (8%), and nutrition (7%). Those same products are not collected abundantly from FD owned land (e.g. energy is 2% of total households and nutrition is 1%).

Forest land ownership is still being digitally delineated in Bangladesh. Nonetheless, the BFI is a sample of the total land area and may be used to generate proportions of ownership types. Based on this approach, 9.4% of the total land is owned by FD which subsequently held 24.5% of the country's total aboveground carbon stock.

Criterion 5 - Tree and forest disturbances (Section 7)

About **32%** of the forest area experience some kind of natural disturbance, with landsliding, other erosion, and cyclones being the most common types. In contrast, in TOF the most common disturbance is waterlogging. Disturbance is also assessed through household interviews where respondents overwhelmingly identified cyclones and infrastructure development as major disturbance types. When asked specifically about the reasons for tree cover loss, the respondents mostly identified degradation in the form of overharvesting and tree removals from construction.

Criterion 6 - Support for forestry activities (Section 8)

The socio-economic survey revealed that few respondents (**1.3%**) reported receiving support for sustainable tree and forest management from any organization. Those who did reported receiving free seedlings and trainings on tree planting. For planting purposes, people usually purchase seedlings and plantings materials from local market; but in some cases, people receive free seedlings from Forest Department also. Nationally, 43% of the households purchase their own seedlings over the past year (2017 to 2018) and spend an average of 1,015 BDT for those seedlings.

Criterion 7 - Trees and forests services and livelihoods (Section 9)

The socio-economic survey revealed that trees and forests are a rich source of materials, energy, nutrition, and income for the majority of households. An estimated 64% of the total population is involved in collecting primary tree and forest products. The total estimated value of the primary tree and forest products collected is **3.07%** of the 2017-18's national Gross Domestic Product (GDP) measured in current price. The value of primary forest products collected by households is on average 19,518 BDT/year, mostly contributed in the form of fruit (47%) and energy (40%).

Trees outside Forest supply most of the country's primary tree and forest products. An exception is in the Hill zone, where about 70% of the timber, bamboo, fuelwood, and leaves, and almost half of the fruits, are supplied from Forest area near the households.

The total value of products used for cooking and heating is 202,927 million BDT/year. The value of these products to households in the Hill zone is nearly four times more than the national average (24,476 v. 6,138 BDT/HH/year, respectively). The average cost of buying forest products for cooking and heating purposes is 2,554 BDT/HH/year nationally.

In terms of income, a household in Bangladesh annually earns BDT 9,160 from selling primary tree and forest products which contributed to **1.29%** of the 2017-18's national Gross National Income (GNI) measured in current market price. Households belonging to higher income classes earn more from tree and forest products. Nowhere is the total annual income from trees and forests greater than in the Sundarban periphery zone at 29,275 BDT/year, which is 9% of the total income of that zone, earned mainly from selling fishery products.



