

Methodology proposed to be adopted for estimation of Total Carbon Stock in forests of various forest divisions of Tripura

The carbon stocks will be estimated in Above Ground Biomass (AGB), Below Ground Biomass (BGB), Dead Wood Biomass (DWB), Litter Biomass (L) and Soil Organic Carbon (SOC) up to 30 cm depth and all the values will be added to obtain total carbon stock in the forest ecosystem by using the following equation.

$$C_T = C_{AGB} + C_{BGB} + C_{DWB} + C_L + C_S$$

C_T = Total C

C_{AGB} = Quantity of C in above-ground biomass

C_{BGB} = Quantity of C in below-ground biomass

C_{DWB} = Quantity of C in dead wood biomass

C_L = Quantity of C in litter biomass

C_S = Quantity of C in soil up to 30 cm depth

Sahu *et al.*, 2015

Estimation of Carbon in Above Ground Biomass (C_{AGB})

To estimate the above ground carbon stocks volume-based approach will be adopted and the carbon stock will be proportionately calculated to the respective forest divisions based on the total growing stock figures reported to the state by the *Forest Survey of India in the India State of Forest Report (2013)*.

$$C_{AGB} = GS_{AGB} \times BCEF \times CF$$

Where,

GS is volume of growing stock in the forest division

BCEFs is *Biomass Conversion and Expansion Factor* for conversion of growing stock to total above-ground biomass is 0.7 (0.7 for humid tropics when GS is more than 200 m³ per ha) (Table 4.5, Chapter 4, Volume 4, IPCC Guidelines 2006)

CF is carbon density factor (country average CF of 0.4524 adopted from Chhabra & Dadhwal 2004).

Estimation of Carbon in Below Ground Biomass (C_{BGB})

$$GS_{BGB} = 0.26 \times GS_{AGB}$$

BGB to AGB ratio factor of 0.26 used. Cairns *et al.* (1997) arrived at a mean of 0.26 with a range of 0.18 - 0.3 on the basis of 160 studies from tropical, temperate and boreal forests - it may be practical to use mean value of 0.26 for arriving at root biomass (Ravindranath & Ostwald, 2008).

$$C_{BGB} = GS_{BGB} \times CF$$

where,

CF is carbon density factor (country average CF of 0.4524 adopted from Chhabra & Dadhwal 2004).

Estimation of Carbon in Dead Wood Biomass Estimation (C_{DWB})

Carbon in dead wood biomass was calculated by using the following formula (Sahu *et al.*, 2015)

$$C_{DWB} = 0.11 (C_{AGB} + C_{BGB})$$

0.11 is IPCC default factor for tropical forests.

Estimation of Carbon in litter biomass (C_L)

Default value of 3.271 t C/ha (Chhabra & Dadhwal, 2004) is the country specific information for Carbon in leaf litter biomass.

Estimation of carbon stock density of soil organic carbon (C_S)

Average soil carbon in top 30 cm (t/ha) for tropical semi evergreen forests is 171.75 t/ha; for tropical moist deciduous forests is 57.14 t/ha; for tropical dry deciduous forests is 57.99 t/ha and for plantations the value is 44.00 t/ha (Ravindranath *et al.*, 1997). These default values will be used accordingly, as carbon stock density of soil organic carbon for the areas identified as the respective forest ecosystems under a forest division.

