

Appendix A

Allometric models have been shown to have large effects on estimates of above-ground biomass (AGB; Brown 1997; Chave et al. 2003). In this paper we use the model of Chave et al. (2005) to estimate the biomass of trees ≥ 5 cm DBH. This model is based on the most extensive analysis to date of datasets of harvested tree biomass from moist tropical forest sites around the world (Chave et al. 2005). However, because we were interested in comparing our results with those of other studies of tropical forest biomass that used different allometric models to estimate AGB, we recalculated our estimates of AGB for trees ≥ 10 cm DBH using four other, commonly used allometric models (models A to D in Table A1: Brown 1997; Chave et al. 2001; Chambers et al. 2001; Chave et al. 2004).

The model we used to estimate AGB of trees in the TC of Ipetí-Emberá (model E in Table A1; Chave et al. 2005) requires users to input both diameter at breast height (DBH) and wood density, while models A to D require only DBH. As such, models A to D assume that local wood density is the same as that of the site(s) where they were originally developed. However, recent studies have revealed large variation in wood density among tropical forest sites. These studies have underscored the importance of correcting biomass models for local wood densities in order to minimize error in AGB estimates, have led to the publication of the ‘average wood densities’ of the datasets on which models A to D are based (Kettering et al. 2001; Baker et al. 2004; DeWalt and Chave 2004; Chave et al. 2003; Chave et al. 2004). When combined with species-specific wood densities, a simple multiplicative factor of (local wood density)/(average wood density of original dataset) or $(\rho_i)/(\rho_{av})$ can be used to correct each model for local wood densities (Chave et al. 2003; Baker et al. 2004; Chave et al. 2004; DeWalt and Chave

2004). We apply this correction here, using the average wood density of trees on Barro Colorado Island for trees for which a species-specific wood density was unavailable (Muller-Landau 2004).

Results

Average AGB per hectare of trees and palms ≥ 10 cm DBH varied by up to 37% within a land-use type when calculated with the alternative allometric models and with/without the correction for local wood densities (Table A2). Correcting estimates for local wood density reduced the average coefficient of variation for AGB within a land-use type from 22.2% to 17.7%. Model E, which we use in this paper, produced much higher estimates for forest sites than did models B, C or D. This reflects the form of the regression curve of this model (Fig. A1); of the five models, model E produces the highest AGB estimates for mid- to large-diameter trees and, therefore, higher total AGB estimates for forest sites. Model A, which has an exponential form, rises steeply at large diameters and therefore also produces relatively high estimates of AGB for sites with large trees (Fig. A1). Overall, the variation in the estimates of the different models emphasizes the importance of comparing the results of different studies using estimates calculated with a single model.