Prediction of the diameter at breast height using diameter at stump height in ombrophilous mixed forest: a tool for forest evaluation

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Basal area (m^2/ha) and diameter distribution are important forest structure indicators. These attributes are strongly related to age, ecological and economic value of the forest. Predictive equations of diameter at breast height (dbh) using diameter at stump height (dsh) are necessary for the calculation of the basal area and consequent forest valuation. In forestry work, the determination of the successional stage of cut stands is only possible through the application of these equations.

Table 1 – Forest structural attributes by Conama Resolution Nº2/1994.

Successional stage	Basal Area (m^2/ha)	Diameter range (cm)	Canopy height (m)
Initial	8 a 20	5 a 15	<10
Medium	15 a 35	10 a 40	8 a 17
Advanced	≥ 30	20 a 60	≥ 30

Figure 1: Brazilian Pine Forest Physiognomy

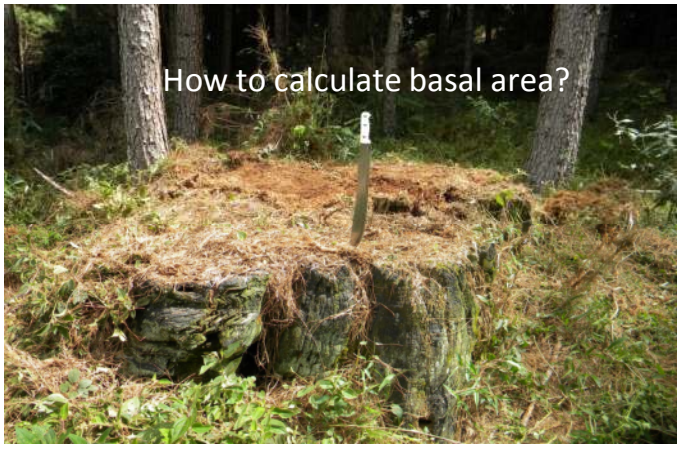

Figure 2: Hardwood stump

CONAMA – CONSELHO NACIONAL DO MEIO AMBIENTE. Resolução n° 2, de 18 de março de 1994, 1994a.

We can get the approximation of original diameter distribution and basal area (m^2/ha) using dbh estimates. The application of this equations is very old in literature. Horn and Keller (1957) adjusted linear equations without intercept in cool-temperate hardwoods and softwoods in Minnesota, USA. The linear factor ranged from 0.775 to 0.861 for hardwoods data. Pond and Froese (2014) in a literature review presented many authors that used simple linear regression as a tool.

In this study we present simple adjusted equations. In Araucarian Forest a linear factor of 0.80 was enough to predict dbh from dsh (Figure 3). In mixed forest with lesser Araucaria angustifolia trees, the better model was the simple linear regression (DBH = 3.7842 + 0.661 DSH). The prediction error was lesser than 10% in both equations.

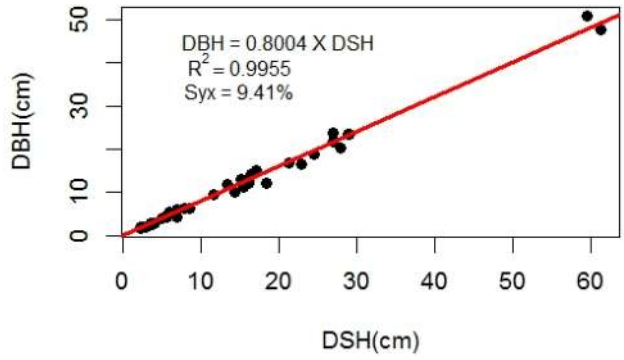

Figure 3 : DSH and DBH relastionship from just Brazilian Pine trees

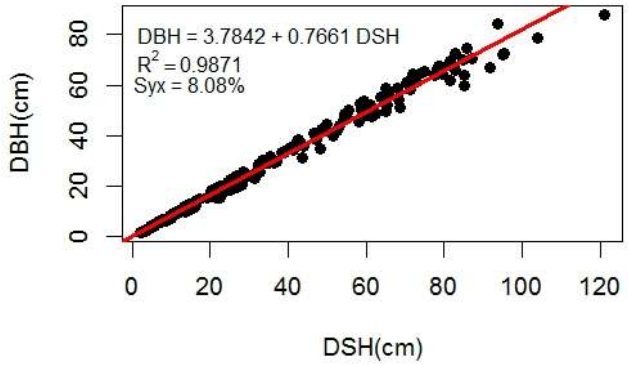

Figure 4: DSH and DBH relationship (from all species)

- Pond, C.; Froese, R.E. 2014. Evaluating published approaches for modelling diameter at breast height from stump dimensions, *Forestry: An International Journal of Forest Research*, Volume 87, Issue 5, Pages 683–696.
- Horn, A.G.; Keller, R.C. 1957. Tree diameter at breast height in relation to stump diameter by species group. Technical Note 507. St. Paul, MN. U.S. Department of Agriculture, Forest Service, Lake States Forest Experiment Station. 2 p.