

# Height Growth of Bigleaf Mahogany<sup>1</sup>

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## SUMMARY

Bigleaf mahogany plantations in Puerto Rico were studied to determine relationships to selected site variables. A significant correlation of tree height was found with mean diameter and depth of the A<sub>1</sub> soil horizon. No correlation was found with age, competition index, location, drainage, slope, or aspect.

## RESUMEN

Se hicieron estudios sobre plantaciones de caoba de hoja grande en Puerto Rico para determinar las relaciones con sitios variables seleccionados. Se encontró una correlación significativa de la altura de los árboles con el diámetro medio y la profundidad del horizonte A<sub>1</sub> del suelo. No se halló correlación alguna con la edad, índice de competición, localización, drenaje, ondulación o aspecto.

Height growth in bigleaf mahogany (*Swietenia macrophylla* King) plantings in the Luquillo and Río Abajo forests in Puerto Rico was studied to determine its relationship to selected site variables. In the Luquillo Forest the stands are located at elevations ranging from 200 to 1300 feet and receive an annual rainfall of 90 to 140 inches. The stands in the Río Abajo Forest are located at elevations ranging from 900 to 1100 feet

and receive an annual rainfall of 70 to 90 inches. All plantations are approximately 25 years old.

Thirty-eight plots were measured, nineteen in each forest. Each plot contained at least six bigleaf mahogany trees and was apparently uniform in slope, aspect, and surface drainage. The site variables, and the degree to which they were measured, were the following:

A <sub>1</sub> horizon texture <sup>2/</sup>	clay
	clay humus
	granular clay humus
A <sub>1</sub> horizon depth	nearest ¼ inch
B horizon texture	clay
	clay loam
Reaction at 14 inches	pH to nearest tenth
Drainage	very well drained
	well drained
	moderately well drained
Slope	nearest one per cent
Aspect	nearest 22.5 degrees

<sup>1/</sup> The field work on which this paper is based was done during the 1962 Syracuse Forestry Summer Course, conducted by New York State University College of Forestry at Syracuse, in cooperation with the U. S. Forest Service Institute of Tropical Forestry.

<sup>2/</sup> The surface soil horizon containing incorporated organic matter.

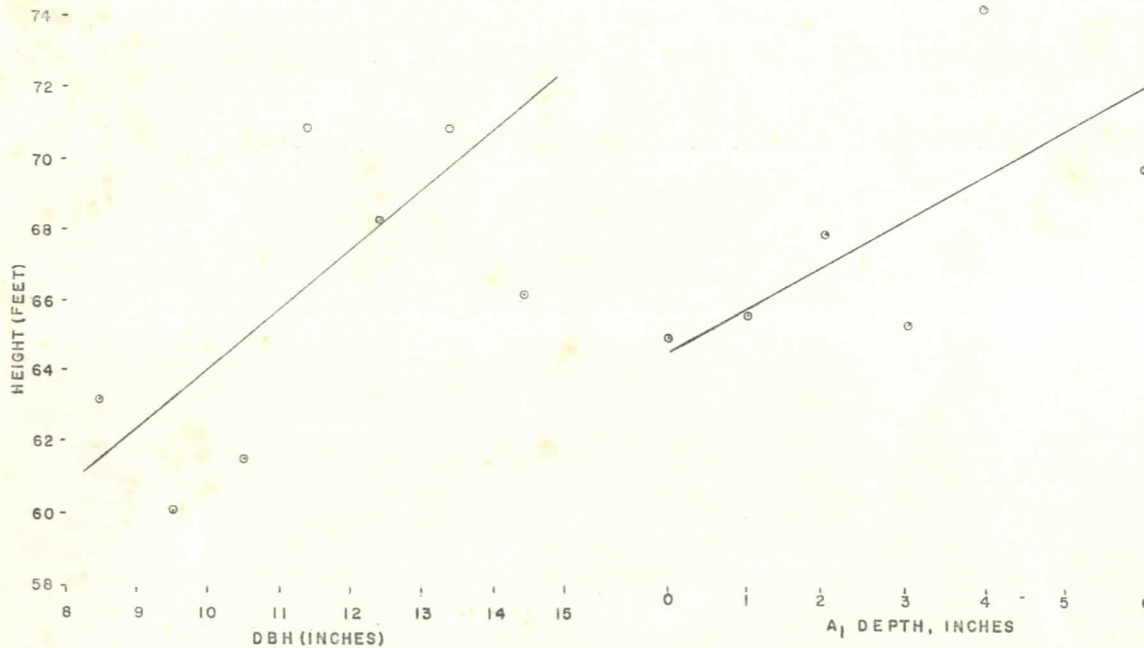


Figure 1. Height of bigleaf mahogany. Line represents computed relationship; circled points represent actual mean values. Left: Height related to diameter breast high. Right: Height related to depth of the A<sub>1</sub> soil horizon.

In addition to this information crown position, diameter at breast height, and total height of each mahogany tree were recorded. Also, an index of competition was obtained by dividing the sum of the basal areas of overtopping trees by the basal area of the crop tree.

The data for each plot were then summarized. Plot mean tree height was tested by regression analysis for correlation with age, diameter, competition index, and gross climatic and geographic differences between Luquillo and Río Abajo forests. Only with diameter was the correlation statistically significant, Figure 1. Tree heights, adjusted to plot mean diameter, ranged from 57 to 76 feet with a mean of 67 feet.

A second regression analysis, using drainage, slope, aspect, and depth of the A<sub>1</sub> horizon as the independent variables, was made for adjusted height. Depth of the A<sub>1</sub> horizon was the only variable with which height was significantly correlated (at the 95 per cent confidence level) and accounted for only one-tenth of the variation in adjusted heights. Within the observed range of A<sub>1</sub> depths from

0.0 to 3.0 inches, each increase of one inch was associated with an increase in tree height of 2.1 feet, Figure 1.

Three possible explanations for the correlation of tree height with depth of A<sub>1</sub> are: (1) that the A<sub>1</sub> horizon is a valuable nutrient source in itself and directly contributes to site productivity; (2) that the A<sub>1</sub> depth is an effect rather than a cause of site productivity, i.e., a more productive site would have produced more organic matter, thus forming a deeper A<sub>1</sub> layer than would a less productive site; and (3) that the depth of the A<sub>1</sub> horizon is an indirect measure of past land use intensity which may have changed physical structure, chemical composition, or effective depth of soil all of which may affect mahogany height growth.

Ninety per cent of the variation in the corrected heights still remains unaccounted for. Untested factors which might account for at least part of this variation are: competition upon the trees in the initial years following planting, genetic differences, and effective depth of soil.