

Environment-tree growth relationships of plantation grown tropical tree species as a basis for sustainable timber production in mixed culture systems in Central Amazonia

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The Brazilian-German research cooperation on environment-tree growth relationships of native tree species of the Central Amazon is part of the development of sustainable landuse systems in this region. For most of the tree species used for timber production in the Manaus region, only few informations on growth and site demands for high quality timber production are available. Therefore, in this project the influence of site conditions of degraded land areas on growth and wood formation of 8 selected native tree species are investigated. As to study the influence of the management of degraded areas on growth and wood formation of the tree species, the investigations are carried out in three different plantation systems (monoculture system, mixed culture system, enrichment of a 25 years old secondary forest) established in 1992/1993 at the CPAA/EMBRAPA, Manaus. Due to the specific site conditions of degraded land areas, the investigations are carried out with special reference to (1) the mineral element and water supply of the trees, the significance of the mineral element and water supply for the (2) plant metabolism and with that for (3) tree growth and wood formation. As to demonstrate the significance of the selected tree species and the plantation system for sustainable timber production in mixed culture systems data are presented for *Swietenia macrophylla* and *Carapa guianensis*.

(1) At all experimental plots tree growth is strongly limited by the K-supply of the soil. The element recycling is improved and the leaching of K out of the soil is reduced in mixed culture systems compared to monoculture systems. In closed plantation systems (mixed culture, enrichment) most of the water output of the system is caused by transpiration, whereas in monoculture systems soil evaporation and runthrough are of main importance.

(2) *Swietenia macrophylla* showed a high specific demand of K for biomass production and wood formation compared to *Carapa guianensis*. The seasonal variation of the water uptake of *Swietenia macrophylla* was more pronounced than of *Carapa guianensis*.

(3) According to that the intraannual variation of wood formation and tree growth of *Swietenia macrophylla* was stronger influenced by a reduced water and mineral element supply than wood formation and tree growth of *Carapa guianensis*, which had to be taken into account for the cultivation of *Swietenia macrophylla* in mixed culture systems.

From these data it was concluded, that *Carapa guianensis* is better adapted to unfavourable site conditions of degraded land areas compared to *Swietenia macrophylla*.

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